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PROTECTION AGAINST COMPETITION.

One of the elements of public-utility regulation which has appealed to utility companies and made them more willing to accept the policy of state regulation is the protection from competition accorded to a company already operating in a given territory as against newcomers. This is the policy of most of our states. The general tendency of regulating bodies has been to afford such protection, and a number of them, as New York, Massachusetts, Wisconsin, Indiana, New Hampshire, Georgia and Pennsylvania have taken a decided stand upon this subject.

The Public Utilities Commission of Idaho took a similar attitude when the question came before it about one year ago, when the Idaho Power and Light Company attempted to invade the territory already supplied by the Great Shoshone and Twin Falls Water Power Company. With a change in the personnel of the Idaho Commission, which has recently taken place, the last named case was reopened and a decision which reverses its previous attitude was rendered last month, and is referred to in detail upon another page of this issue. This case is of considerable interest and importance to utility companies for several reasons.

A close inspection of the decision handed down by the present commission, permitting the Idaho Power and Light Company to operate in the territory in question, shows that it does not commit the Commission to a general policy of competition, since the opinion specifically states that the Commission is in general opposed to the idea of competition and bases the present decision upon a policy already adopted by the Railroad Commission of California, whose attitude is that of holding the possibility of competition over the heads of utility companies as a club which may be used to strike at any time when the behavior of a given utility may seem to warrant it. This policy guarantees protection against competition to a utility only when several conditions of service are met. These are, (1) that adequate service is being rendered by the first company at the time the second appears on the scene as an applicant for a certificate or franchise; (2) that the rates are reasonable and as low as could be given by another company furnishing adequate service, and (3) that the territory in question is completely served. The Idaho Commission decided that these conditions, more particularly the third, had not been fully met by the Great Shoshone Company, and consequently that the Idaho Company should be permitted to operate in the same territory.

This attitude of the Commission makes it incumbent upon utilities already serving a given territory to see that their service and rates are as free from faults as possible and consequently not subject to just complaint, before any competitor appears on the horizon. Under the policy adopted by the California and Idaho Commissions, it is too late to think about these matters after the competitor has applied for a certificate of convenience and necessity.

Another important consideration involved in this decision is the liability to changes of policy in a regulating commission whenever the personnel of the commission is changed, and the latter is likely to take place at the time of any political upheaval or even upon the inauguration of a new administration, though it be of the same political party. Commissions seem to be more subject to such changes than are courts, where precedents have great weight and where a change in personnel involves a change in legal interpretation only in rare cases where some important principle is involved. This condition, attaching to our state commissions particularly, is a very unfortunate one and detracts greatly from the efficacy of this method of control of public utilities. An example of this is to be found at the present time in Wisconsin, where the commission, which has been one of the leaders in developing policies of state regulation, seems likely to be entirely superseded under the new administration of that state.

HELPFULNESS OF REGULATING COMMISSIONS TO UTILITY COMPANIES.

The public utility commissions of the various states have usually been looked upon as bodies whose principal function was to limit rates and prevent the charges of utility companies from becoming extortionate. It should be borne in mind, however, that this is but one of the services performed by such a commission and that among the others are some which are of quite as much advantage to the operating company as to the consumer.

One factor of this side of a commission's work was well brought out in the paper by Messrs. J. N. Cadby and C. B. Hayden presented before the annual meeting of the Wisconsin Electrical Association at Milwaukee and reported in last week's issue. While the large utility company is always supplied with expert engineering talent, this is far from true for the smaller companies. While the paper in question emphasized particularly the lack of such talent in planning the design and in carrying out the operation of many small utilities, it served to show incidentally how those same companies which cannot afford to regularly employ expert engineers can profit very greatly from the suggestions made by the engineers of the Railroad Commission at the times of their regular inspections. While many of the conditions found were positively ludicrous in the eyes of the engineer, they are nevertheless a serious question of fact and a criticism by the Commission's inspectors can aid very largely in bettering the conditions. It is undoubtedly the small utility concerns which secure the greatest benefit from a regulating commission, not only in the direction pointed out, but also with respect to accounting and other details of management.

It will, for this reason, be very deplorable if the political upheaval which has taken place in Wisconsin should result in curtailing the activities of the Railroad Commission in any way or in depreciating the quality of its personnel. While complaints have been rife in regard to the taxation necessary to support the many commissions which have sprung up under the "Wisconsin idea," it should be remembered that the services rendered, at least by the Railroad Commission, are worth far more to the people of the state than the cost involved in their maintenance.

THE OUTLOOK.

In answer to telegraphic inquiries sent to leading manufacturers of electrical apparatus in various parts of the country on Wednesday of this week, the information is gleaned that in several directions inquiries and orders for January show an increase over December. According to some manufacturers the gain was considerable, and the present outlook is encouraging. These manufacturers look for greater improvement during the spring months. On the other hand, a few manufacturers find conditions still adverse, with January showing no improvement over the previous month, and there are one or two scattered instances of a decrease for the month just passed. The inquiry covered the field pretty generally, and the majority of opinions are to the effect that business is better and the tendency is toward a cheerful outlook. In this connection the announcement in the daily newspapers that the Illinois Central Railroad had awarded a contract for locomotives to the extent of $1,500,000 is an encouraging sign. There are other reports of large purchases by the railroads, and it is understood that numerous contracts have been let by the railroads during January and that many others will be made during the present month.

The utterances of President Wilson, upon the occasion of the meeting of the American Electric Railway Association at Washington, D. C., last week, referred to on another page of this issue, are certainly of a reassuring nature. This and the fact that the meeting of the National Chamber of Commerce of the United States held at Washington, D. C., during the past week took special cognizance of the needs of business and the necessity for encouraging that form of legislation that would tend to a restoration of confidence, should make all of our manufacturers and distributors more certain of the stability of their enterprises. The recommendations of the Special Committee on Maintenance of Resale Price, also quoted elsewhere in this issue, to the National Chamber of Commerce will be regarded by many as

a step in the right direction, and will undoubtedly go far toward clearing up what has been a very unhappy situation for the past three years.

THE EVOLUTION OF LIGHTING FIXTURES.

The traditional form of electric lighting fixture or chandelier appears to have been handed down from the days of gas-lighting practice. The fixtures used in the first electrical installations appear to have been copied after those used for gas-lighting purposes. This was quite natural, since many of the first installations were combination fixtures, which required the best possible adaptation of electric lamps to fixtures primarily designed for the gas-lighting equipment. The only regrettable feature in this connection is that the same style of fixture should have been retained when the gas element was discarded and fixtures designed for the use of electric lamps alone. The inherent objections to a ceiling fixture dangling down into space which otherwise would be left open and unobscured, was somewhat lessened by the efforts made to render such fixtures as highly decorative as possible. This should not obscure the fact that the typical fixture has no proper place in electric lighting and is but a survival of the combination fixture which should long ago have been discarded.

With the direct system of electric lighting, there is seldom any necessity for cluttering up ceiling space with the more common types of ceiling fixture. Electric lamps can well be mounted at the ceiling itself, or high up upon the walls of rooms having high ceilings, with nothing more projecting from the surface than perhaps the diffusing glassware used to diminish the extreme intrinsic brilliancy of the lamp itself, and to secure a better distribution of the luminous flux. Of course there are many installations where other types of luminous source are necessary or desirable, but the above remarks will apply to a large majority of installations using direct lighting.

Where it is desired to use indirect or semidirect systems, it may be necessary to suspend a container or reflector from the ceiling. In such cases the supports should be made as short as possible. In cases where they are applicable, floor pedestals may well be used in place of ceiling fixtures, and in smaller rooms wall outlets might well furnish all of the necessary sources for either indirect or semidirect systems.

In some cases it may be considered necessary to use ceiling fixtures in order to bring the sources of light nearer to the working plane and economically secure sufficient intensity. This is sometimes a forceful reason in high and narrow rooms. With ceilings of ordinary height, however, it does not apply, and in large rooms the advantage in this direction very largely disappears, since with proper direction of the light flux, it will nearly all reach the useful plane.

Many minor exceptions may be brought up to the use of light sources at the ceiling. For instance, in bedrooms and bathrooms it may be desired to have wall brackets so located as to throw intense side lights upon the occupants. Other cases, too, will suggest themselves where wall brackets are desirable in order to get the light flux in the same direction as obtains in the case of daylight; but these cases are exceptions, rather than typical cases.

One advantage of doing away with the ordinary chandelier, or similar fixture outlet, would be the accompanying necessity of supplying separate wall, floor or baseboard outlets for various current-consuming devices, as well as table lamps. Such circuits would then be designed for the use to which they are applied, and the common possibility of overloading fixture outlets would be avoided. Of course when the ordinary lighting outlets are placed out of convenient reach, the use of wall switches becomes a necessity, but this is a convenience which is growing more general for all types of installations, and which should be encouraged to the greatest extent.

The aim of designers and architects should be to get as speedily as possible away from the unsightly ceiling fixture which, even in its most decorative forms, is nothing more nor less than an anachronism.

COMPLETING IMPROVEMENTS IN ILLUMINATION.

Partial betterments in lighting installations are preferable to keeping on in the old inefficient way, but why not carry work of this sort to its logical conclusion? Not long ago an auditorium was remodelled from the lighting standpoint, the area near the speakers' desk being equipped with an up-to-date installation of high-powered tungsten lamps and semi-indirect fixtures, in place of former metallized-filament units poorly subdivided and unsatisfactorily mounted. Strange to say the good work stopped short at this point, and the lighting of the audience chairs was continued on the old and eye-straining basis. Lack of funds to make the change was not the trouble, but apparently inability to appreciate that more money can be saved as a rule by carrying through a finished job at one time than by adopting piecemeal methods. It so happened that the change made in the speakers' desk lighting was effected largely to save the time of high-salaried officials who are frequently consulted in the room; but somehow the man responsible for the alteration, which yielded almost double the original amount of light locally that was enjoyed originally, failed to realize that poor illumination in the rest of the audience chamber delayed the consultation of notes and papers and hindered the official body in a way which never would have happened had the whole job been planned and executed at one and the same time. It is all right to make a trial installation of a more efficient lighting unit here and there; but when the apparatus has been approved, putting off a general extension of the improvements over the premises as a whole is inexcusable.

Electrical Manufacturers Make Progress in Organization Plans.

The meeting of the Electrical Manufacturers, which was called in accordance with the plans adopted at a meeting at the Hotel Biltmore, New York, on January 12, has been postponed from February 9 to March 9. The Organization Committee held a meeting on February 1. In view of the fact that the manufacturers of electrical apparatus are already equipped with a working organization, the Electric Power Club, and that the Electrical Manufacturers' Club comprises in its membership most branches of the electrical manufacturing industry and has from time to time dealt with general problems affecting the entire manufacturing industry, and in view of the fact that the manufacturers of electrical supplies are not similarly organized, the Organization Committee recommends that a meeting of all electrical manufacturers be called to convene at the Biltmore Hotel, New York, so that plans may be discussed for the formation of a "National Association of Manufacturers of Electrical Supplies."

Subsequent to this organization it is proposed that the new association appoint a committee of five members, who shall request a conference with a similar committee of five members of the Electric Power Club to jointly consider with the Electrical Manufacturers' Club the practicability of utilizing the Electrical Manufacturers' Club as a governing body to deal with the larger interests affecting the entire manufacturing industry, embracing both manufacturers of electrical supplies and manufacturers of electrical apparatus.

The chairman, R. K. Sheppard, of the electrical manufacturers' meeting of January 12, will welcome communications from all electrical manufacturers who are interested in the contemplated organization. He desires to disseminate widely the invitation to the meeting to be held March 9. All manufacturers communicating with him, in care of B. F. Goodrich Company, Akron, O., will be notified of the hour and meeting place for the next gathering of the electrical manufacturers, at which gathering the organization committee will give its report. At that meeting the nominating committee will report its suggestions for the personnel of the proposed representative committee of business and technical experts, which committee shall study thoroughly both our present practice of all-insulated circuits and coincidently the principle of grounded return circuits, and endeavor to produce something better than concentric wiring. The committee will probably include in its personnel business and technical experts and representatives of research and development departments of manufacturing and other enterprises, including the Underwriters' Laboratories and the National Electric Light Association. It has been suggested that to such a committee the industry should entrust:

(1) The determination of the relative efficiencies of the two systems: (a) as to safety to persons; (b) as to protection against fire; (c) as to the possible provision of methods of wiring at low cost, combined with ease of installation and sufficiently attractive appearance to obtain popular approval.

(2) To present to the entire industry the results of its investigations in the form of concrete recommendations, including standard systems, standard devices and standard appliances.

At the meeting of electrical manufacturers, held at the Hotel Biltmore, New York City, on January 12, the chairman was authorized to appoint a committee of nine on organization, and a committee of five to suggest names for a committee of business and technical experts. Chairman B. K. Sheppard has announced the following appointments on these committees:

Committee on Organization: W. T. Pringle, Pringle Electric Company, New York, N. Y.; Walter Cary, Westinghouse Lamp Company, Philadelphia, Pa.; D. C. Durland, Sprague Electric Works, New York, N. Y.; W. C. Robinson, National Metal Molding Company, Pittsburgh, Pa.; E. R. Harding, Holtzer-Cabot Electric Company, Chicago, Ill.; G. A. Cragin, American Steel and Wire Company, Chicago, Ill.; N. C. Cotabish, National Carbon Company, Cleveland, O.; J. W. Perry, H. W. Johns-Manville Company, New York, N. Y.; J. E. Way, R. Thomas & Sons Company, New York, N. Y.

Committee to Suggest Business and Technical Experts to Consider Concentric Wiring: LeRoy C. Clark, Safety Insulated Wire and Cable Company, New York, N. Y.; H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; L. W. Downes, D. & W. Fuse Company, Providence, R. I.; Gerard Swope, Western Electric Company, New York, N. Y.; W. K. Bryant, Bryant Electric Company, Bridgeport, Conn.

Upholds Maintenance of Resale Price.

At the annual meeting of the Chamber of Commerce of the United States, held this week at Washington, D. C., Paul T. Cherington, chairman of the Special Committee on Maintenance of Resale Prices, urged legislation permitting the maintenance of resale price under proper restrictions on identified merchandise for voluntary purchase made and sold under competitive conditions as in the best interest of purchaser, distributor and consumer. The report states that the matter is serious and complex, and suggests that conditions instead of correcting themselves must eventually grow worse. The report suggests also that the National Chamber of Commerce urge upon the new Federal Trade Commission, when it shall be appointed, the importance of completing the inquiry already begun by the Bureau of Corporations. Legislation should aim to secure to the public at large all possible benefits from progress in production and in distribution methods. Under price-maintenance systems the only losers would be the price-cutters. The price-cutters' customers lose by being obliged to pay more for other goods than they pay proportionately for the article on which the price is cut. The Chamber of Commerce of the United States will probably submit a referendum of proposed legislation on this subject to the 600 or more trade organizations embraced in the National Chamber.

Physical Light.

At a meeting of the Chicago Section of the Illuminating Engineering Society held in Chicago on the evening of January 29, Clayton H. Sharp, of New York City, gave a demonstration lecture on "The Knowns and Unknowns of Physical Light." Dr. Sharp took up the fundamental principles of the subject from the basis of the flux theory of light. Striking experimental demonstrations were made of regular and diffuse reflection, prismatic refraction, spectral colors, selective reflection and transmission, photometric measurements, etc. Among other things there were explained the reasons for the greater efficiency of tungsten compared with carbon lamps, the general principles of light production, the present need for high-temperature sources, and the possibility of producing "cold light" at an efficiency of close to 100 per cent. Dr. Sharp, in pointing out the example of the firefly, which has practically perfect efficiency in light production without heat, expressed the opinion that further study and development along this line will yield most important results in our efforts to improve the efficiency of light sources by producing in them only luminous radiation.

In the general discussion that followed the lecture, in which Chairman Durgin, F. A. Vaughn, J. R. Cravath, J. B. Jackson, E. H. Freeman, F. A. Rogers and Dr. Sharp took part, many points relative to the as yet unknown features of the subject were touched on.

At the February meeting of the Section Dr. Nelson M. Black, of Milwaukee, Wis., will present a paper.

Electric Towing System for the Panama Canal Locks.—II.

The first installment of this article described in detail the driving mechanism of the towing locomotives. This week the windlass mechanism is described and illustrations given of the complete locomotive. The Panama Canal represents the first application of towing locomotives electrically driven, and they are giving entire satisfaction.

Passing now to the features which render the locomotive peculiarly adapted for towing purposes, it is to be noted that the drum on which the cable is wound, is located midway between the ends of the locomotive and above the upper member of the side frames, so that the cable can be led off on either side of the machine and through a wide range of angles to the line of travel. The hub (No. 74, Fig. 15) of the drum is pivoted to the hub (No. 75) of a spider (No. 76) which in turn rotates upon the upper portion of a massive, tubular, vertical cylindrical column (No 77) rising from a pedestal secured to the baseplate or floor, which is supported on the lower members of the side frames. (See Fig. 18.) The upper portion of the pedestal is held in a brace, which is a heavy X-shaped casting, fastened to the upper members of the side frames and to two of the cross beams. This brace fits the pedestal just below the shoulder on which the hub is stopped.

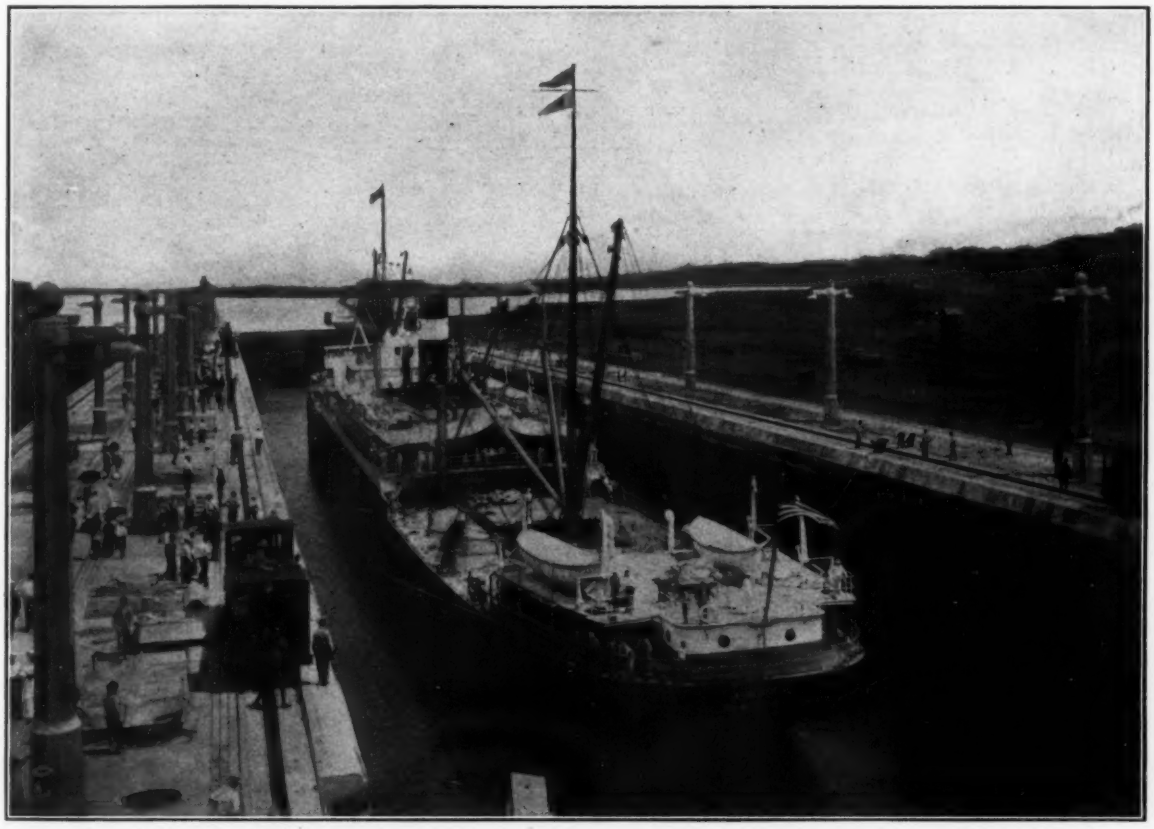


Fig. 14.—Steamer "Ancon" Entering Upper Lock at Gatun Under Tow of Electric Locomotives.

The spider (No. 76) supports a circular rim (No. 82) which has a horizontal upper surface (No. 83) and a flange (No. 84). On the surface (No. 83) is secured a flat smooth bronze ring (No. 85), and a second brass ring (No. 87) similar to the first lies on top of a steel ring and is secured to a flanged follower (No. 88). Sixteen studs (No. 89) project up from the rim (No. 82) through holes in a horizontal flange of the follower and are encircled by strong springs (No. 90) which abut between the flange and nuts (No. 91) on the studs and press all three rings tightly together. The steel ring (No. 86) is secured to lugs (No. 92) on a flange (No. 93) projecting downward from the winding drum (No. 72) so that the rings constitute a friction clutch between the spider and the drum.

Inside the flange (No. 84) on the spider is secured a large internal gear (No. 94) with which mesh two driving pinions secured respectively to two upright shafts. Step bearings are provided for these shafts in the base of the pedestal, while the arms projecting from the upper portion of the pedestal just below the brace constitute guide bearings for the upper portions of the vertical shafts. A worm gear is clutched to the shaft and is driven by a worm on the shaft of an electric motor bolted to the base of the locomotive. This gearing is protected by a casing. A bevel gear is keyed to the upright shaft and meshes with a bevel pinion on the shaft of an electric motor fastened to the base.

The motor with bevel-gear pinion is used for driving the drum at a high speed when coiling the cable that has been cast off, and it remains permanently in gear. The other motor with worm-gear drive is used for taking in the cable when it is under load, and the drum operates as a windlass or capstan.

Due to the greater gear reduction, it operates the drum at a much slower speed; and consequently, with motors of approximately equal size, a greater force may be exerted on the tow line than would be possible with the lower speed reduction which is used with the high-speed coiling motor. The worm-gear drive is disconnected from the drum when not in use. To accomplish this a clutch is provided, having one member (No. 112, Fig. 16) splined to the shaft, and the other member (No. 113) attached to the hub of the worm gear, which is sleeved on the shaft.

A lever (No. 115) fulcrumed to a lug (No. 116) on the arm, is pivoted to the hub of the clutch member (No. 112), and its other end is attached to the movable core of a solenoid (No. 117), which is connected in the controller circuit of the motor, so that whenever the circuit of the latter is closed to coil up the cable rapidly, the solenoid will lift is core and also the lever (No. 115), thus throwing out the clutch of the winding motor. The first point of the controller which operates the motor raises the clutch, and on the second point the motor starts.

The guide which directs the cable, as it pays out or winds up, is mounted so as to revolve on the axis of the drum. It comprises two angularly adjustable portions (No. 118 and No. 119, Fig. 15), the former being a circular bell which serves as a cover for the winding drum. The hub (No. 120) of the bell is journalled on the upper end of the column (No. 77), being stepped on a shoulder thereon. At one side the housing is cut away to admit the cable to the drum, and on each side of this opening is bolted one end of a frame, comprising box-like ends (No. 121) connected by two parallel bars (No. 122), one above and the other below the opening. Between the bars and on either side of the opening are two upright guide rolls (No. 123) having cylindrical faces and rotating on journals bearing on the bars (No. 122). At each end of this frame, arms extend downward and support two rollers, mounted on horizontal studs secured in the arms. These rollers are adapted to travel between the upper and lower flanges of a circular channel iron (No. 127) which is fastened on top of the side frames concentric with the column (No. 77), and forms a track supporting the outer end of the frame, thus relieving the column of the weight thereof. Stops are fastened to the top of the channel iron to limit the angular play of the guide member. They can readily be taken off, and the housing can be turned until the rollers are on the opposite side of the locomotive, after which the stops can be attached on that side to limit the movement of the housing.

The other guide member (No. 119) is a radial casting having one end turning freely on the hub of the member No. 118. A cap (No. 129) is provided at the top of the column and protects the joint and prevents the guide members from accidentally coming off. The outer end of the member No. 119 is an upright rectangular frame (No. 130), in whose top and bottom is journalled on a vertical axis, a swivel (No. 131) carrying two grooved sheaves (No. 132), these also being led one above the other on horizontal axes. The edges of these sheaves are in close contact, so that their grooves form an opening through which the cable passes, approximately in line with the middle of the guide rollers (No. 123). The frame No. 130 is supported by rollers (No. 133) running in the track (No. 127), and the guide member has an angular movement with reference to the member No. 118, limited by the frame No. 130 striking the ends of the frame No. 121. When the cable is pulled either forward or backward from the middle position, the swivel permits the grooved rollers (No. 132) to move with it, and the guide member (No. 119) swings also, so that the rollers continue to support the rope in a line with the middle of the rollers without being themselves subjected to any side strain. All lateral strains are sustained by heavy guide rollers (No. 123), the cable moving up and down between them as it winds on the drum. The latter is in the form of a deeply grooved wheel, the groove (No. 134) being U-shaped. Fig. 17 clearly illustrates the construction.

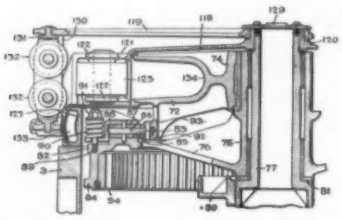


Fig. 15.—Cross-Section of Cable-Guiding Device.

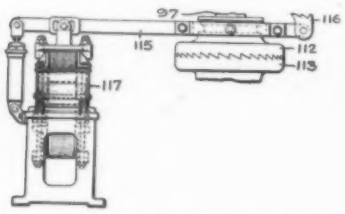


Fig. 16.—Clutch-Operating Mechanism.

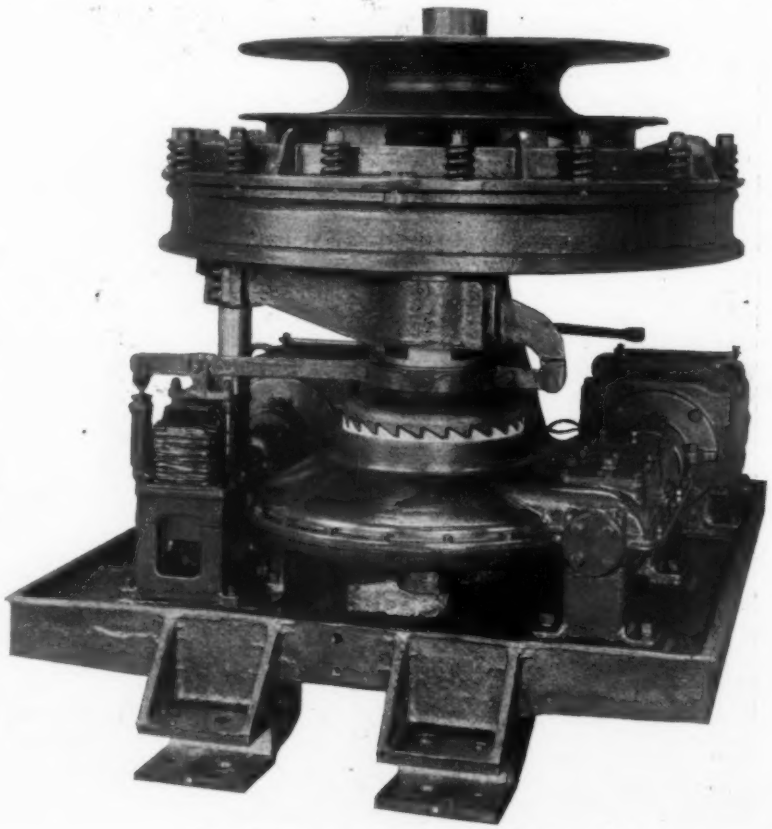


Fig. 17.—Windlass and Base Assembled.

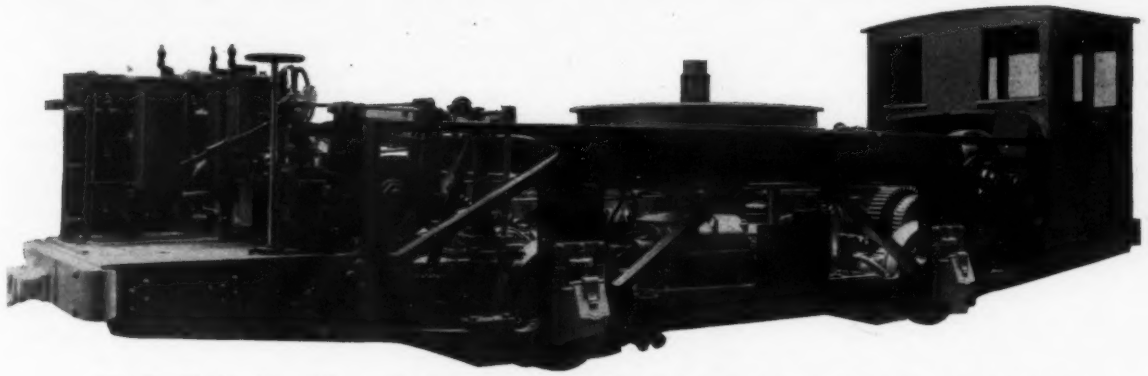


Fig. 18.—Electric Locomotive With Covers and One Cab Removed, Showing Controllers and Front of Panel.

The cable guard is a steel casting having a thickness of only three-eighths of an inch. The diameter is 4.5 feet and the circular flange is 17 inches deep. This casting was pronounced to be beyond the possibilities of the ordinary open-hearth furnace by a number of steel foundries. The castings were eventually produced in the contractor's electric furnace, where it is possible to intensify the heat so as to make the metal flow more rapidly. No failures occurred. With the exception noted, all other principal steel castings for these locomotives were produced at the plant of the Wheeling Mold & Foundry Company, Wheeling, W. Va.

In order to resist the tendency of the locomotive to tip over when an excessive load comes on the cable, a stout rack rail is, as previously mentioned, laid between the traction rails of the track, and two horizontal flanged wheels are arranged between each pair of wheels to engage the opposite sides of the rack. These wheels are carried on heavy bars whose inner ends are pivoted to the base of the machine, so that the bars can move horizontally. Their outer ends are engaged by strong springs, which afford the necessary flexibility for smooth operation.

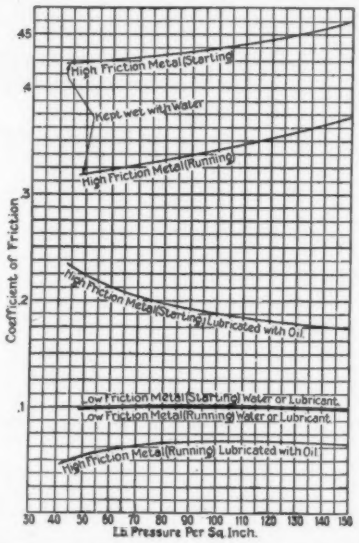

Coefficient of Friction
.45
.4
.3
.2
.1
High Friction Metal (Starting)
Kept wet with Water
High Friction Metal (Running)
High Friction Metal (Starting) Lubricated with Oil
Low Friction Metal (Starting) Water or Lubricant.
Low Friction Metal (Running) Water or Lubricant.
High Friction Metal (Running) Lubricated with Oil
30 40 50 60 70 80 90 100 110 120 130 140 150
Lbs Pressure Per Sq. Inch.

Fig. 19.—Results of Tests on Friction Metal.

One of the most important parts of the locomotive is the "slip-friction" device, consisting of two special alloy rings, mounted on the spider, as has been previously explained. Between these rings a steel disk is fastened to the rope drum; and the amount of tension on the tow line is adjusted by the pressure between these three disks. and is obtained by tightening the spiral springs on the clamping ring. In order, therefore, to make the slipping tension of the towline proportional to the pressure between the friction disks, a rubbing surface having an absolutely constant coefficient of friction is essential. In order to find such a metal, certain tests were made as indicated by the accompanying curves in Fig. 19 which is self-explanatory. The low-friction metal, having a friction coefficient of 0.1, is practically constant under all pressures and conditions of

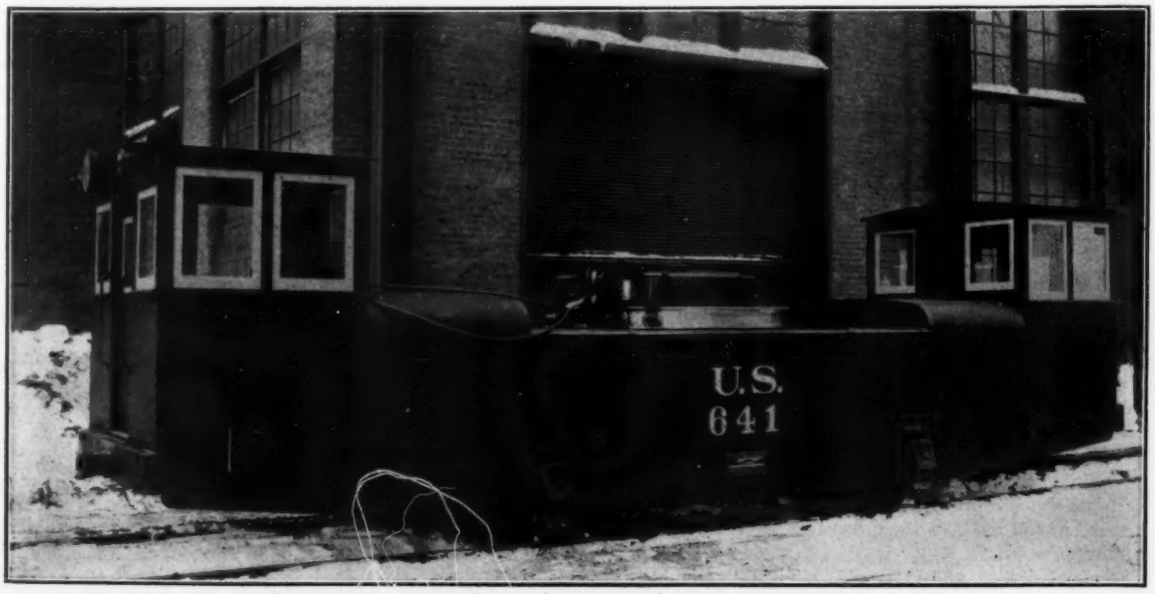


Fig. 20.—Complete Towing Locomotive for Panama Canal.

the surfaces, and therefore was selected for the work. This metal also showed but very little difference in coefficient between starting and running. The results of the special tests were furthermore amply verified by the final test of the friction disks of each machine under full rated towline pull of 25,000 pounds by means of a dynamometer testing outfit. All 40 machines were given this slip test 25 times from each cab, and all passed the government requirement not to exceed a variation of 5 per cent above or below the normal of 25,000 pounds.

In connection with the slip test, further data on the slow-winding motor were obtained as per curves in Fig. 22. The winding motor is a 20-horsepower (one-hour rating), three-phase, high-torque, squirrel-cage-type, induction motor controlled from a drum-type reversible controller in either of the two cabs. From the curves it is seen that the motor has ample power to take care of any sudden pull on the towline up to 40,000 pounds, which is well above the normal requirement of 25,000 pounds. The speed of winding is at the average rate of 12 feet per minute.

The rapid-coiling motor is permanently geared to the drum and is of the same type, size and capacity as the winding motor. It is subjected to its maximum load when accelerating the heavy drum to the high speed required for coiling or paying out the rope, this being sixteen times the slow winding speed at full load, or about 200 feet per minute.

The slow-winding and the rapid-coiling motors are operated by similar controllers and the circuits electrically interlocked so as to prohibit application of power to either motor unless the controller of the other motor is in the "off" position.

Each of the two main traction motors has a rating of 75 horsepower, and is of the slip-ring induction type, operated by a system of contactors with master controller in each cab. The motors, by means of the change in gearing from straight traction to rack-rail towing previously described, drive the locomotive at a speed of two miles per hour when towing and five miles per hour when returning idle. These motors act as induction generators running above synchronous speed when the locomotive is passing down the steep inclines and thereby exert a retarding brake effect to keep the speed uniform. Speed, tractive effort and efficiency tests were made with results shown in curves in Fig. 23.

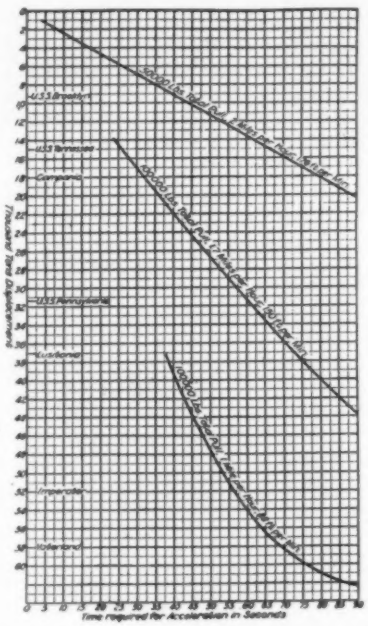


Fig. 21.—Time Required for Acceleration of Ships.

The curves in Fig. 21 give some interesting data on the time of acceleration of ships in the lock chambers. These values have been obtained from certain tests and theoretical calculations based on data given by several well known authorities.

For determining the resistance of ships in deep open water, the following formula is given by Charles W. Dyson in his work, "The Estimation of Power for Propulsion of Ships":

$$R = f S V^{1.82} + bD^{0.67} V^4 / L$$

where

R=resistance in pounds.

f=surface friction coefficient, varying from 0.008 to 0.009.

S=wetted surface in square feet.

V=speed in knots per hour.

b=form-factor, varying from 0.35 for fine long ships to 0.05 for freighters.

D=displacement of ship in tons.

L=length of ship in feet on load water line.

The above formula gives, as stated, the resistance in deep open water; and it is well known that this is greatly increased when ship is passing through narrow channels, due to the reaction of the water on the side walls and bottom. This additional resistance may be found by the following formula, given in a report by the state engineer of New York on the proposed Barge Canal (See *Engineering Record*, June 29, 1901):

$$R_1 = 6.8/(r - 1.3)$$

where

r=ratio of canal section to midship boat section.

In order to obtain the total ship resistance, the value of R previously obtained should be multiplied by the value obtained for R_1.

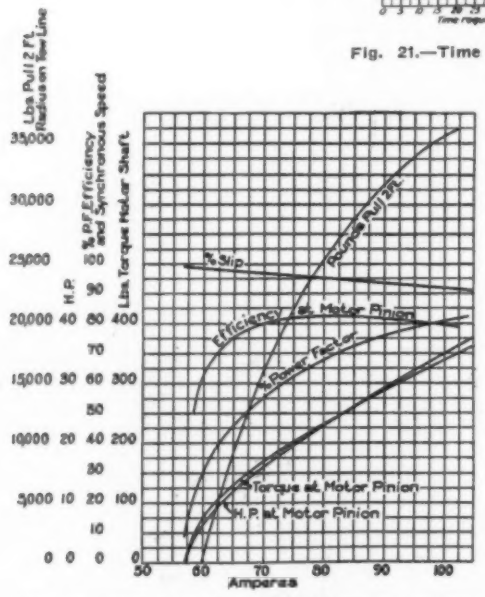


Fig. 22.—Characteristic Curves of Windlass Motors.

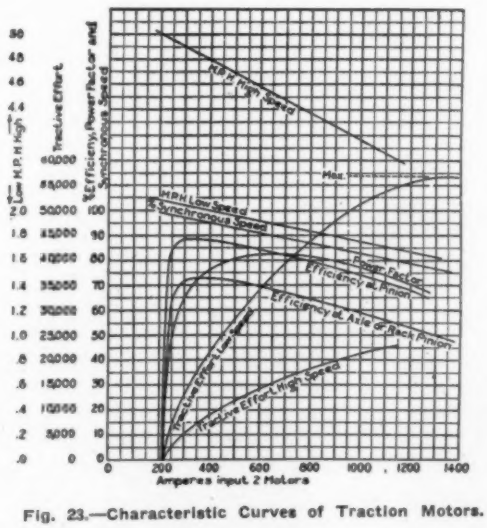


Fig. 23.—Characteristic Curves of Traction Motors.

Summary.

The towing locomotives as described and illustrated possess the following operating characteristics:

(*1*) While towing, the speed can be regulated from zero to two miles per hour.

(*2*) While running idle, the speed can be regulated from zero to five miles per hour, permitting return trips at increased speed.

(*3*) The windlass will pay out or wind in cable at the low rope speed and at the full towline pull of 25,000 pounds, either when the locomotive is running or at rest.

(*4*) The windlass will pay out or coil in cable at the high rope speed with the towline taut, either when the locomotive is running at full speed or is at rest.

(*5*) The windlass is equipped with a safety friction device, which is adjustable to any predetermined value of the towline pull.

The first impression may be gathered that these machines are somewhat complicated; but, considering their many functions and the great flexibility for performing them, the design is in reality peculiarly simple. The locomotives have fully demonstrated in actual operation that the requirements contemplated by the engineers of the Isthmian Canal Commission have been successfully met.

The locomotives have a net weight of 86,300 pounds and a gross shipping weight of 92,500 pounds. They were mounted on specially designed skids and shipped by rail to New York, where they were loaded on board the ships as deck cargoes by means of a Merrit-Chapman 125-ton floating derrick.

During the first three months of commercial operation of the Canal, from August 15 to November 15, 1914, the cargo transported through the Canal and towed through the locks by the locomotives amounted to 1,079,521 tons. During the fiscal year ending June 30, 1914, the Panama Railroad carried 643,178 tons of through freight between the two seaboards, and in the preceding fiscal year 594,040 tons. From this it is seen that between six and seven times as much cargo is passing over the Isthmus now as passed over this route when goods were transshipped by rail.

Commercial Practice
Management, Rates, New Business

An Analysis of Central-Station Practice in Wisconsin Regarding Rural Service.

A comprehensive analysis of conditions in Wisconsin as regards the use of electricity on the farm is presented in the accompanying data which are taken from a report recently compiled by a committee of the Wisconsin Electrical Association, under the direction of W. E. Haseltine, manager of the Ripon Light & Water Company. The information covers 23 central stations of the State which are serving rural customers, the number of customers supplied ranging from one each in the case of five companies to 60 in the case of one utility.

Table I indicates the conditions under which rural service is furnished by the companies referred to. The total number of rural consumers reported was 182 while the average number per company reporting was 8. The average maximum distance of customers from the station was 2.9 miles. Eleven companies furnished primary line; ten companies furnished transformer; ten companies furnished secondary line; and all companies reporting furnished meter.

In eight cases where the farmer furnished part of the equipment, some arrangement for refund was made, usually by applying all or part of the monthly bills towards the purchase of line equipment by the company.

The table shows that 12 companies furnish single-phase alternating current only; 8 companies furnish both single-phase and polyphase current; two companies furnish direct current only; one company furnishes both single-phase alternating current and direct current.

An analysis of the business in the Wisconsin towns in question is given in Tables II and III, Table II referring to the patrons furnished with light or combined light and power, while Table III covers consumers using power only.

From Table I, using the weighted averages, it is evident that the kilowatts of connected load per consumer is 2.79 and the kilowatt-hours per annum per consumer 446; the transformer capacity per consumer is 1.94; the income per consumer per annum, $41.35.

It will also be seen from the data that the kilowatt-hours per annum per kilowatt of connected load is 183, and the income per annum per kilowatt of connected load, $17.74.

For consumers using power only, covered in Table III, the kilowatts of connected load per consumer is 4.18, while the kilowatt-hours per consumer per annum is 487, and kilowatt-hours per

TABLE I—COMPANIES REPORTING RURAL SERVICE.

City	No. Consumers	Max. Distance from Station	Farmer Pays for: Primary	Transformer	Secondary	Meter	Refund	Current: Single phase	Polyphase	Direct Current	Line for Rural Service Only	Is Business Profitable?	Line Voltage	Investment per Kilowatt Connected Load
Amery	1	....	No	No	No	No	....	....	....	....	....	....	.....	.....
Green Lake	1	....	No	No	No	No	....	Yes	Yes	....	....	Yes	.....	.....
Beloit	21	3.5	Yes	Yes	Yes	No	No	Yes	....	....	Yes	Yes	.....	.....
Durand	1	4	No	No	No	No	....	Yes	....	....	....	Yes	6,600	.....
Durand	5	4	No	No	No	No	....	Yes	....	....	....	Yes	6,600	.....
Ellsworth	1	1	Yes	Yes	Yes	No	No	Yes	....	....	Yes	Yes	6,600	.....
Glenwood	2	3	No	No	No	No	....	Yes	....	....	....	Yes	.....	.....
Grafton	4	2.5	No	No	Yes	No	No	Yes	....	....	....	Yes	.....	.....
Janesville	11	13	Yes	No	No	No	No	Yes	....	....	....	Yes	6,600	$350.00
Lake Mills	..	4	Yes	Yes	Yes	No	....	Yes	Yes	....	Yes	Yes	6,600	.....
Lomira	8	1.5	No	No	No	No	....	....	....	Yes	....	....	.....	.....
Merrill	2	2	Yes	Yes	Yes	No	Yes	....	....	Yes	....	Yes	.....	300.00
Oakfield	2	5	No	Yes	No	No	No	Yes	Yes	....	....	Yes	6,600	.....
Oconomowoc	60	2	Yes	Yes	Yes	No	No	Yes	....	....	Yes	Yes	.....	250.00
Shawano	6	1.5	Yes	Yes	Yes	No	No	Yes	Yes	....	....	....	.....	.....
Sheboygan	12	20	Yes	Yes	Yes	No	No	Yes	....	Yes	....	Yes	13,200	.....
Sturgeon Bay	12	3.5	Yes	Yes	Yes	No	No	Yes	....	....	....	Yes	.....	.....
Theresa	3	3	No	Yes	No	No	No	Yes	Yes	....	....	No	6,600	.....
Hudson	3	....	Yes	Yes	Yes	No	No	Yes	....	....	Yes	Yes	13,200	.....
Marinette	8	5.5	No	No	No	No	....	Yes	Yes	....	....	Yes	.....	.....
Oshkosh	17	5	No	No	Yes	No	No	Yes	....	....	....	Yes	.....	.....
Walworth	1	3	Yes	Yes	Yes	No	No	Yes	Yes	....	....	Yes	.....	.....
Eau Claire	6	0.5	Yes	Yes	Yes	No	No	Yes	Yes	....	....	....	33,000	125.00

TABLE II.—RURAL STATISTICS LIGHT AND LIGHT AND POWER COMBINED.

	No. of Consumers	Kilowatts Connected Load	Kilowatt-hours Per Year	Transformer Capacity Kilowatts	Income Per Year	Per Consumer: Kilowatts Connected Load	Per Consumer: Kilowatt-hours	Per Consumer: Transformer Capacity	Per Consumer: Income	Per Kilowatt Connected Load: Kilowatt-hours	Per Kilowatt Connected Load: Income	Per Kilowatt Connected Load: Transformer Capacity	Per Kilowatt Connected Load: Income per Kilowatt-Hour, Cents
Amery	1	1	226	..	$ 24.40	1	226	..	$24.40	226	$24.40	...	11
Green Lake	1	1	59	2.5	10.92	2.5	59	2.5	10.92	59	10.92	2.5	18.5
Durand	1	2.5	400	3	30.00	2.5	400	3	30.00	160	16.00	1.2	7.5
Durand	5	4.5	.....	6	81.00	0.9	...	1.2	16.20	...	18.00	1.3	..
Ellsworth	1	3.12	306	5	78.27	3.12	306	5	78.27	98	25.00	1.6	25.5
Glenwood	2	..	.....	3	50.00	..	...	1.5	25.00	...	.....	...	..
Grafton	4	50	.....	18	.....	12.5	...	4.5	.....	...	.....	0.4	..
Janesville	11	20	25.57	..	281.73	1.81	232	..	25.61	127.85	15.08	...	11
Lomira	8	11.5	14.30	..	228.80	1.43	179	..	28.60	124.34	19.90	...	16
Merrill	2	2.75	16.94	..	169.40	1.38	847	..	84.70	616	61.60	...	10
Oconomowoc	45	100	23,807	60	2,380.70	2.22	238.07	0.6	52.90	238.07	23.80	0.6	10
Shawano	4	7	.....	7.5	40.00	1.75	...	1.87	10.00	...	5.71	1.1	..
Sheboygan	1	..	16.24	..	56.06	..	...	..	56.06	...	.....	...	3.4
Sturgeon Bay	12	..	.....	..	.....	..	...	..	.....	...	.....	...	..
Theresa	3	..	595	15	61.40	..	198	5	20.45	...	20.46	...	10.3
Hudson	2	5	1,600	5	138.00	25	800	2.5	69.00	119	27.60	1	8.6
Marinette	6	74.4	4,336	29.5	278.78	72.4	722.66	4.91	46.46	58.28	3.75	0.4	6.4
Oshkosh	17	24	6,990	23	654.48	1.41	411	.96	38.49	291	27.27	10	9.2
Walworth	1	1	500	1	50.00	1	500	1	50.00	500	50.00	1	10
Eau Claire	2	2.7	540	..	61.00	1.35	270	..	30.50	200	22.60	...	11.3
Total	129	310.11	46,664	178.5	4,674.94	49.77	5,389	34.54	697.56	2,817.54	372.09	...	168.7
Arith. Average	5.5	..	.....	..	.....	3.11	385	2.66	38.74	216	23.25	1.1	11.2
Weighted Average	..	..	.....	..	.....	2.79	446	1.94	41.35	183	17.74	0.6	9.7

annum per kilowatt of connected load, 151. The income per annum per kilowatt of connected load is $12.18.

In order to permit of a comparison between farmer and urban business the following table of the Wisconsin Railroad Commission giving statistics reported by the companies for 1914 relative to the consumption in kilowatt-hours per kilowatt of connected load for the various classes of consumers is presented.

Class.	Kilowatt-hours per annum per kilowatt of connected load.
Churches	101
Laundries	185
Lodge Halls	194
Schools	236
Residences	239
Theaters	367
Offices	400
Livery Stables	402
Stores	471
Hotels	505
Signs	551
Bowling Alleys	809
Depots	937
Saloons	955
Industrial Establishments	1069
Restaurants	2209

It will thus be seen that the farmer receiving service for light only or for light and power combined who uses 183 kilowatt-hours per kilowatt of connected load, occupies a position very close to the bottom of the urban list. In fact, there is only one class of consumers who use less, that is churches.

Urban residences average 239 kilowatt-hours per kilowatt of connected load as against farmers, 183.

There is one feature which enters into the farmer business and affects its revenue to the station quite materially, and this is the fact, that as a rule the business is so widely distributed that it requires a separate transformer for almost every consumer, whereas in urban business it is the practice, and is generally entirely possible, to connect quite a large number of consumers from a single transformer.

This would result in the core loss per kilowatt of connected load being very much higher for the country than for the city consumer; first, because the core loss in small transformers is much greater per kilowatt of capacity than larger sizes; and, second, on account of having a large number of consumers on a single transformer in the city, it is generally possible to reduce the transformer capacity per kilowatt of connected load considerably below the point which would be safe were each consumer connected to a separate transformer.

Take as an illustration of the above a typical farmer consumer who has a connected load of 2.79 kilowatts, who consumes 446 kilowatt-hours per year, with a transformer capacity of 1.94.

The core loss on a two-kilowatt transformer is approximately 20 watts per hour or 263 kilowatt-hours per year. Therefore, the total energy delivered to this consumer would be 446 plus 263 or 709 kilowatt-hours. Of this the core loss would be 263 kilowatt-hours or 37 per cent.

With the city resident, on the other hand, having the same connected load, the consumption from the data furnished by the Wisconsin Railroad Commission would be 769 kilowatt-hours. If this consumer was connected to a 10-kilowatt transformer, it would be perfectly safe to assume a transformer capacity of 0.15 for his service.

The core loss on a 10-kilowatt transformer is approximately 70 watts per hour, or 614 kilowatt-hours per year. The core loss assignable to this resident would, therefore be 0.15 of 614 or 92 kilowatt-hours. Adding this to 769 kilowatt-hours consumed, we get a total delivery by the company of 861 kilowatt-hours, of which 92 kilowatt-hours or about 11 per cent is the core loss.

But the important thing is the return on the investment. Using as a basis the income per annum per kilowatt of connected load given in Table II, or $17.74, and assuming that 60 per cent of the receipts will be used up in operating charges, exclusive of depreciation, we get:

Total receipts per kilowatt of connected load	$17.74
Operating costs, 60 per cent of above	10.64
Balance for interest and depreciation.	$ 7.10
Capitalized at 15 per cent	$47.30

Bearing in mind that the average investment in rural service per kilowatt of connected load is reported as being $266, it would seem before the farmer can be considered in the class with other available business, his load-factor must be greatly improved.

The foregoing comments are intended

TABLE III.—RURAL STATISTICS—POWER ONLY.

	No. of Consumers	Kilowatts Connected Load	Kilowatt-hours Per Year	Transformer Capacity Kilowatts	Income Per Year	Per Consumer: Kilowatts Connected	Per Consumer: Kilowatt-hours	Per Consumer: Transformer Capacity	Per Consumer: Income	Per Kilowatt Connected Load: Kilowatt-hours	Per Kilowatt Connected Load: Income	Per Kilowatt Connected Load: Transformer Capacity	Per Kilowatt Connected Load: Income per Kilowatt-Hour, Cents
Green Lake	1	3	527	5	$ 52.70	3	527	5	$52.70	176	$17.63	1.7	10
Beloit	21	86.9	11,266	67.2	1,021.64	4.1	536	3.2	48.65	129	11.74	0.8	08.9
Ellsworth	1	1.5	.....	..	18.00	1.5	...	..	18.00	...	12.00	...	..
Oconomowoc	15	30	5,116	30	405.80	2	341	2	27.05	170.53	13.52	1	07.9
Shawano	3	31.50	.....	27	378.00	15.75	...	12.5	189.00	...	15.12	0.9	..
Sheboygan	11	..	2,280	..	124.24	..	207	..	11.29	...	.....	...	05.5
Marinette	2	30	1,920	30	127.60	1.5	960	15	63.80	64	4.25	1	06.6
Eau Claire	4	9.1	5,160	..	336.00	2.28	1,291	..	84.00	567	36.92	...	06.5
Total	57	192.08	26,269	159.2	2,463.98	43.67	3,862	..	494.49	1,106	111.18	...	45.4
Average	7	..	.....	..	.....	6.24	644	7.5	61.80	221	15.88	1.1	07.6
Weighted Average	..	..	.....	..	.....	4.18	487	3.7	43.25	151	12.18	0.9	07.9

to apply simply to the conditions as they exist today. As the farmer becomes better acquainted with the advantages of electricity, especially for power use, the situation will improve to such an extent that farmer business may be eventually classed with city business, and possibly in some cases even superior to it. This would be especially true if farmers were trained along the lines of using small motors for long hours instead of, as is their present tendency, being desirous of using comparatively large motors for short periods of time.

There are places in Wisconsin where companies have placed transformers for the use of farmers for as large motors as 15 horsepower, for ensilage cutting. This is a work which occupies only a few days during the year, and if the transformers are connected permanently, a great part of their capacity must remain idle for the balance of the time.

How this would affect the company's income per kilowatt-hour can be seen from the fact that two 7.5-kilowatt transformers have a core loss per annum of approximately 1,000 kilowatt-hours, which would be equal to seven 10-hour days' full-load consumption of the motor.

If motors of this size are to be connected at all, it would be much better practice to employ the method, which some companies are now using, of mounting a bank of transformers and motor upon a truck and leasing this outfit to farmers for their use at so much per day. The transformer loss would then be incurred only during the time when the motor was actually in use.

Public Service Talks.

The first of the educational classes of the Public Service Company, Hudson Division, for year 1915, was given January 28, in the Public Service Auditorium, Jersey City, N. J.

J. G. Orr, acting district commercial manager of the New York Telephone Company, delivered a very interesting talk on "The History of the Telephone," illustrating his subject with stereopticon views. D. R. Dusenberry, of the advertising department of the New York Telephone Company, read an instructive paper on "Selling by Telephone."

Utah Company Section Meeting.

T. C. Martin, executive secretary of the National Electric Light Association was the guest of the Utah Light & Traction Company Section of the N. E. L. A., at its regular monthly meeting in the Consolidated Music Hall, on January 28. Mr. Martin had with him and exhibited to the members for the first time, photographs taken of the illuminated buildings and grounds of the Panama-Pacific Exposition at San Francisco.

Electric Cooking in Poplar Bluff.

The Missouri Public Utilities Company, of Poplar Bluff, Mo., serves a population of approximately 7,000 inhabitants, and has connected to its lines a total of 25 electric ranges, of the Hughes type. At a recent convention of the managers of properties controlled by the Light & Development Company, of St. Louis, which includes the Poplar Bluff company, F. M. Wilkes, local manager, presented an interesting paper outlining the methods used in obtaining this unusual amount of business.

Commenting on the characteristics of the various electric ranges available, Mr. Wilkes said electric stoves now on the market are, in general, divided into two classes: those following the idea of the first flat iron, in which the heating coil is totally inclosed in metal, and those in which the original idea of a toaster has been developed. For each of these types the respective manufacturers, putting them on the market, claim great advantages over the other type, but due to the greater rapidity of the open-coil stove it has the call over the inclosed type. Again, human nature must be taken into consideration. For countless generations women have done practically the bulk of the cooking and have come to regard a heat which they cannot see the evidence of in a red glow, as not at all satisfactory for cooking. "Due to this fact," said Mr. Wilkes, "I believe anyone handling electric stoves will find it much easier to get a woman to endorse the stove of the glowing coil type than one of the inclosed type. Having decided on an open type of coil, we now find this type in turn divided into the automatic and non-automatic types. Here again we have the same objection to the automatic as we have already attached to the inclosed type of element—that is, the human equation is not brought into play. Also, another cause of trouble is added. In clock control we meet with the danger of clock troubles and the fact that voltage variation is not taken care of. With the thermostat control we have really the most scientific and economical form of cooking device yet invented, but it is hard to realize the present-day kitchen mechanic or for that matter, the present-day mistress, setting the thermostat for each different operation which it is necessary to perform during the day.

"Having decided on what stoves to handle and what size to carry, we are now ready to commence sales. Before starting selling stoves, it seemed very simple. All that seemed necessary was to put the stoves on exhibition, explaining through newspapers and by letters to prospects that here at last was a fireless cooker, one that did not take hours and hours to cook, but really, in baking, at least, reduced the time of getting a meal at least one-fourth. A campaign of this kind got no results, however. We were then confronted with the fact that this, at least, was not the way to sell stoves, no matter how well it might work when applied to other articles. Of course, it at once occurred to us to put out stoves on demonstration. But here an apparently insurmountable difficulty presented itself. An electric stove, unlike an iron or a vacuum cleaner, cannot be used off of the ordinary house service. Indeed, in order to get good results it is necessary not only to have No. 6 secondary line wire from the transformer, but at least No. 8 for the service drop and No. 8 from the service entrance to the stove. This, of course, would mean that to put a stove in a house for demonstration purposes we would have to spend from ten to twenty dollars for material and keep two men busy all day making the installation. Then if, for any reason, the stove should be thrown back on our hands, we would be out the whole cost of the test as the material in the house at least would cost more to remove than it was worth.

"Just when despair over the stove question was beginning to loom up, however, the president of one of the local women's clubs came in to see our stoves. She was disgusted with trying to cook on an evil-smelling gasoline stove, and agreed to take one of our stoves provided we would guarantee its cost of operation as against coal or wood. With coal at four dollars per ton it only took a few minutes to figure that we would be safe in making the guarantee in regard to coal, and it seemed pretty safe to gamble that wood would cost pretty nearly the same as coal, so we made her the proposition that we would install our No. 33 stove for $65, same to be cash, and that we would agree to take this stove back any time within four months should the monthly bill exceed $4.50.

"We made the installation almost a year ago now, and her bill has never exceeded $4.00. Perhaps at this point it may be interesting to know how we arrived at the cost of coal as against electricity; I will therefore give my reasoning. Taking meal by meal, we have the following: Breakfast—consisting of cereal and fruit, coffee, toast, bacon and eggs. With electricity this would take about 15 minutes and would require not over 0.25 kilowatt-hour; with coal, if a fire is made big enough to make the coffee, it will require not less than 15 pounds of coal. Luncheon—steak, one vegetable, salad, coffee, cold bread. Electricity, 0.25 kilowatt-

hour, coal, 15 pounds. Dinner—roast, two or more vegetable, salad, coffee and some sort of dessert. With a roast of, say five or six pounds this will take about one and one-half hours with electricity, and will consume about two kilowatt-hours; with coal, it will take about two and a half hours and will take not less than 40 pounds of coal.

"We have then, for an average day, a cost, with electricity at four cents, of 10 cents, while to supply the same food with coal would take 70 pounds of coal, which at $4.00 per ton would have cost 14 cents, or, in other words, electricity at four cents will be as cheap as coal at $2.85 per ton. Similarly, electricity at four cents can be shown to equal artificial gas at $1.35. This leaves only two forms of cooking which are cheaper than electricity, or enough cheaper to make this a decisive point. They are, first, natural gas, and second, gasoline; and against the latter of these we have the item of danger of explosion, which in most cases can be made to offset the saving. The above figures have so far checked nicely with the operation of the electric stoves which we have out. Of course, where the family is more than five, or where a great deal of fancy cooking is done between meals, the bills for electricity, coal or gas will all be proportionately larger.

"Under this guarantee proposition we then proceeded to work on stove prospects, and by the end of September, 1914, we had some 20 stoves in use, all giving satisfaction. At that time the equipment of the new domestic-science department came up before the Board of Education. The board was about evenly divided between coke and gas stoves, without any one but the superintendent of buildings in favor of electricity. We felt that we just had to have this business—but how to get it?

"We tried to talk the domestic-science teacher into recommending electric stoves, but to no avail. Finally we got them to consent to come in and look at our stoves before buying coke or gasoline ranges. The domestic-science teacher rang up at 2 p. m. one day, and told us that three members of the board, the principal of the schools and herself would be down at 5 o'clock to look at our stoves. We at once fitted my office up as a dining room by covering the table with a cloth and borrowing the necessary utensils. We then connected up one of our stock stoves which stood out in the display room in front and arranged five chairs in a semi-circle about six feet from the stove. The educators came promptly at 5, and at our request were seated around the stove. I explained to them that we wanted them to see how easy it was for even some second-rate electricians to cook on an electric stove. We then proceeded to cook a dinner, consisting of broiled steak, asparagus on toast, fried corn, Southern style, hot biscuits, mashed potatoes and coffee, right before their eyes. At ten minutes to six, or just 50 minutes after they had entered and less than 40 minutes after I first turned on the current, we served them one of as good meals as they ever sat down to. That night when the stove question was brought up, the board voted unanimously to buy nine electric stoves for the High School. These stoves now pay us from $40 to $50 per month revenue.

"Soon after this incident we made another advance in selling stoves. It happened that a man wanted some charging cable, 500 feet, he said, and requested us to order it. We did, but before it came he decided that he only needed 100 feet. We put the remaining 400 feet in stock. There it had lain for nearly a year when the bright idea hit us. Why not use this for stove demonstrations? It was No. 8 wire, well enough insulated to be strung over a tree limb around the corner of a house and over the window sill into the kitchen, and could be put up or taken down in less than an hour with scarcely any damage to the wire. We now have by means of this charging cable, a method of installing our No. 17 stove up to our No. 50 stove on trial, with only slightly more cost than that of placing an iron or a vacuum cleaner."

New Business Activities at Columbus.

Perhaps one of the most notable examples in the country of progress through special campaigns in increasing the domestic consumption of electricity is that furnished by the Columbus Railway, Power & Light Company, Columbus, O., during 1914. A gain of between 40 and 50 per cent was realized. This feature of the company's business was dwelt upon at length in an address by President McMeen at the annual meeting on January 23. So readily has the public responded to every form of educational work, that this kind of effort will be pushed with vigor.

Some very ingenious methods have been employed. In order to get the people interested in the use of the electric iron, for instance, the company last February advertised that it would give a certain allowance on the ordinary sad iron which the customer might bring in when purchasing one of the electric-heating type. Though a small thing in itself, this idea caught on, and the company accumulated an interesting assortment of sad irons, which served as an object lesson in their show rooms before being sold to the junk man. A corps of demonstrators has carried the gospel of electric cooking, heating and laundrying into the homes wherever opportunity presented, without waiting for the public to come to headquarters and witness demonstrations, although that feature has not been neglected. The motorcycle trouble squad, available 24 hours in the day and seven days a week, has been a big factor in popularizing the use of electrical appliances.

Two very extensive wiring campaigns were conducted during the year by Manager Wolls, one of them still being in force. They have been very successful. The popular-payment plan, which applies to the wiring and equipment of a residence, as well as to the sale of all kinds of appliances, has been featured strongly. No customer, whether he was in the wrong or not, has been allowed to be dissatisfied with any transaction. Money is refunded or exchange made without argument when a customer returns an article that has been damaged through his own carelessness or ignorance. The point is, that after testing out the most liberal policy that could be conceived and working it vigorously, the company has found that it has paid. Some new campaigns and advertising methods are now in .preparation.

Edison Company Gives Luncheon to Illinois Garage Owners.

The Garage Owners' Association of Illinois, which gathered in Chicago in convention during the Automobile Show, January 23 to 30, were tendered a luncheon at the Hotel Metropole, on January 27, by the Commonwealth Edison Company.

About 150 members, including the ladies, were present. Addresses were made by Robert Bland, president of the Garage Owners' Association of Ilinois, John F. Gilchrist, vice-president and E. W. Lloyd, general contract agent of the Commonwealth Edison Company, Harry Salvat, Mr. Potter, Mr. Harmon and Mr. Rudd.

Tasty souvenirs in the form of small boxes of chocolates, bearing the Edison Company's emblem, were presented to the ladies. The luncheon was attended by garage men not only from Chicago, but from all parts of the state. Music was furnished by the Commonwealth Edison Orchestra.

Utilities Required to Instruct Customers in Meter Reading.

An ordinance was recently approved by the City Council of Cleveland, O., requiring public utility companies to print on the backs of all bills for light and power, facsimiles of meters with instructions for reading.

Electric Sign Data

A Novel Electric Sign.

A decidedly novel and distinctive electrically illuminated sign, and one that cannot fail to attract the favorable attention of the passerby, day or night, has recently been erected by The Texas Company, on one of its buildings, at Port Arthur, Tex. The building is the one in which the well known Texas company motor oils are filtered.

The wording of the sign as shown in the accompanying illustration is "The Texas Company." The sign consists of 15 nine-foot letters painted white forming an attractive sign by day, while at night it is made considerably more attractive by reason of the unusual illumination afforded. This is of a pea-green color, and is obtained from Cooper Hewitt lamps placed behind a reflector located in front of the sign. This characteristic color of the illuminant makes the sign distinctive and leaves a pleasing impression on the passerby whose attention it never fails to get.

In addition, the trade mark of The Texas Company is a red star and green tee, the tee being in the center of the star, and all of the packages of oil, in addition to carrying this trade mark, have a body color of pale green, which is quite closely approximated by the color of the illumination, therefore making it particularly appropriate.

The sign is 155 feet 10 inches long, mounted on the top of the building, has a height of 9 feet 2 inches and is supported by a substantial iron frame work. The height above the top of the building is over 9 feet, thus making it easily visible all over the surrounding country.

The light is furnished by sixteen type H Cooper Hewitt lamps mounted in iron boxes placed 11 feet in front of the sign. These boxes are of particular interest, being made of corrugated iron top and sides with a glass face just large enough to accommodate the lamp. A special reflector is placed just beneath the tube of the lamp and throws the light directly against the face of the sign.

The lamps are operated four in series on a 240-volt direct-current circuit, supplied by the company's own plant, and taking 3.5 amperes in each circuit, or 192.5 watts per lamp. This gives a total energy consumption for the installation of approximately three kilowatts, thus making a very economical as well as an attractive sign.

Electric sign for Texas Company. The framework was designed and built by the company's engineers and the letters were furnished by the George E. Watson Company, Chicago.

Sign is 155 feet 10 inches long and 9 feet 2 inches high. It is lighted by means of 16 Cooper Hewitt lamps in special reflectors installed about nine feet in front of sign. Total installation requires three kilowatts.

The Toledo Railways & Light Company has inaugurated a campaign with the object of selling at least one electric sign a day throughout the year 1915. Nearly 500 electric signs were sold during 1914. Ernest G. Richards, chief designer of the Valentine Electric Sign Company, of Atlantic City, is in the city to stay indefinitely and will co-operate in the campaign. Toledo is getting a reputation as one of the best lighted cities in the country. The present list of electric sign users includes many of the prominent churches of the city. The latest religious organization to fall in line is the First Congregational church on Collingwood Avenue, which has a large sign burning every night. Pastor Allen A. Stockdale is a believer in modernizing his church and believes thoroughly in electrical advertising. Other churches are carrying electrical crosses and electric signs.

G. H. Farrell, Des Moines, Iowa, is planning to establish in Dayton, O., a factory for the manufacture of a patented electrically illuminated bulletin board, for use in announcing the arrival and departure of steam and electric railway trains. A plant for the manufacture of these signs has already been established in Des Moines, where Mr. Farrell is associated with his father, M. J. Farrell, in the business. The signs are so constructed as to give room for advertising space, which is also electrically illuminated, and Mr. Farrell states that they have already proved successful in operation.

Electric signs and electrical displays added much to the success of the banquet of the Louisville (Ky.) Tru-Ad Club, held recently at the Watterson Hotel. One large electric sign spelled "Truth" in large letters and here and there about the room were smaller signs giving the same word in the miniature illuminated letters of the Federal Sign System (Electric). During the banquet the room lights were turned off and the waiters went about by the aid of the trainmen's lanterns swung over their arms. A series of mechanical lightning flashes and thunder was succeeded by flashing of the signs.

Electrical Construction

CHEAPER WIRING.

Views of Authorities in England.

In view of the importance of this matter, and bearing in mind the continuous efforts that have been made by electrical manufacturers in England during several years past, with no insignificant measure of success, to introduce means for reducing the cost of installation work, we have approached, through our British correspondent, a number of the leading experts, and they have very courteously placed their experiences and impressions of the situation at our disposal. Some of these views appear below, representing the conclusions of three types of observer—the electric supply authority, the installation contractor, and (very briefly) the conduit maker. Other opinions will apepar in succeeding issues:

THOMAS ROLES, city electrical engigineer and manager of Bradford, Yorkshire, one of the most progressive municipal electricity supply undertakings in the United Kingdom, whose opinions on popularizing domestic electric service expressed at meetings of the Point Fives, the Municipal Electrical Association, and the Institution of Electrical Engineers, have frequently been referred to in these pages, writes stating that although it is not the practice of the Bradford Electricity Department to carry out electric wiring by direct labor, efforts have been made in the city by various electrical contractors to cheapen the cost of electrical installations. He continues:

"Some seven years ago a suggestion was made by the local branch of the Electrical Contractors' Association that consideration should be given to the use of the Continental method of wiring by means of a twisted duplex wire having an appearance very similar to flexible cord. The chairman of the local branch of this Association and I inspected some buildings wired on this principle in Frankfort-on-Main, but came to the conclusion that while there was no doubt the system was eminently practical, wires run in this manner detracted from the appearance of the building in which they were installed, and that the system would not be looked upon with favor in English houses where it is the practice to conceal all wiring, and even the switches and fuses as far as possible.

"In discussing the matter with one of the Frankfort electrical contractors, we were informed that the general tendency in that city was towards concealing the wires in all new installations. For this purpose, in cases where surface work was necessary the wires were drawn into thin brass tubes, with an insulated lining which took the place of the wood casing generally used in England. I believe that the gentleman who accompanied me on this visit on his return to this country went very carefully into the matter of using this special tubing, but came to the conclusion that it was no cheaper than systems of wiring already in vogue in Bradford.

"On the issue of the 1907 edition of the Wiring Rules of the Institution of Electrical Engineers, Clause 45 of which stipulated that flexible wires could be run on the surfaces of walls and ceilings under certain conditions, several local contractors wired portions of buildings on this system. This department, however, insisted that a very good class of flexible should be used for the purpose, which added to the cost of the work, and probably this fact, together with the general dissatisfaction of the British public at seeing wires run on insulators in buildings, has prevented the adoption of this method of wiring to any considerable extent.

"Efforts were made by several contractors to utilize the Stannos system, the wires and fittings in connection with which are supplied by Messrs. Siemens Brothers & Company, Ltd. As a result of their experience, however, they found that in most buildings wiring on this system proved more expensive than if carried out in wood casing or steel conduit. With reference to the use of this system it should be remembered that our voltage of supply for lighting purposes in districts supplied by alternating current, as well as in those supplied by direct current, is 230, and, therefore, the metallic sheathing of the 'Stannos' wires can only be used as a mechanical protection and for earthing purposes. For very low-voltage installations, such as carried out by Messrs. Siemens Brothers in some parts of London, the sheathing is used as one of the conductors, and this, of course, very considerably reduces the price of the installations in which this course can be taken, as only one wire is required in place of the two necessary for working at ordinary supply voltages. None of our contractors, however, appear to have found it advantageous to put in transformers and work at a low pressure, probably because owing to the cheap rates offered by this department for current supplied for heating and cooking purposes, so many of their clients require heating and cooking circuits.

"Our latest move in the direction of cheapening installations is to give consideration to the use of 'cab-tyre' sheathed cables as supplied by the St. Helens Cable Company, Ltd., such cables not being provided with mechanical protection in the form of steel conduit or wood casing. It is proposed that such cables should be laid between joists below the floors of rooms, and where the joists are crossed they should be laid direct in notches cut for them. It is also intended that such wires should be buried in plaster-covered walls, or otherwise if the question of appearance is not a matter of moment, should be run on cleats on the wall surface.

"These proposals are certainly a radical departure from the generally accepted practice, and the suggestion has been put forward as a result of experience with the use of the cable, the rubber insulation of which maintains its qualities under very adverse conditions. It, of course, remains to be seen whether the fire insurance companies will agree to accept risks in connection with premises wired in such a manner. In the event of their not agreeing, I cannot see but that we shall have to continue to use present methods in connection with new installations, and with reference to these I would say that as far as my own experience is concerned, I am of the opinion that in dry situations wood casing is, as a rule, the most satisfactory material which can be used for the mechanical protection of the wires. In damp situations, however, steel conduit should be used, preferably metallically connected throughout, the joints having an electrical conductivity at least equal to that obtained when screwed barrel is used, the whole being efficiently earthed at one point."

W. R. RAWLINGS, A. M. I. E. E., president of the Electrical Contractors' Association, Incorporated, and head of the London electrical installation firm of Rawlings Brothers, Limited, says: "My experience is based upon the 'Stannos'

heavy sheathed system which is composed of an ordinary insulated wire covered with a double layer of tinned copper soldered to form one tube, and my remarks apply to this system. I am more or less convinced that in the near future the whole of the wiring will be carried out upon the earthed outer sytem, for the following reasons:

"(1) Only one wire being necessary as the outer protecting covering is used for the return, aims at simplicity of apparatus; added to this the total resistance to the circuit is reduced by reason of the outers being bunched (which is bound to take place) smaller wires can be employed than required for the two-wire system.

"(2) Any self-contained wire, by which I mean sheathed wire, ensures complete continuity of the covering and therefore removes any troubles which may arise from faulty joints found in a conduit system.

"(3) The wires can be fixed upon the surface (with proper clips) without in any way destroying the decorations, and where they continue to be run out of sight the continuous sheathing is ensured even against careless workmanship.

"(4) As the wire is absolutely waterproof, a cheap and efficient water-tight system can be ensured by soldering the wire to Kalkos water-tight fittings.

"(5) From the contractors' point of view there is little risk in tendering as there is an absence of special fittings, enabling him to estimate to a fine degree. Stock is reduced to practically wire and fixing plates, making the system universal.

"(6) Even where the two-wire system is employed the Stannos wires are equally useful, and being composed of copper sheathing there is no trouble arising in their use on alternating-current circuits. The system can also be used in combination with conduits and many installations are arranged with heavy conduits for distribution, with Stannos branches. This, however, applies only to the two-wire system and scarcely comes under the heading of these notes.

"(7) Having installed some thousands of lights on the Stannos concentric system I unhesitatingly say that I prefer it to any other wiring system known.

"(8) One word further, on the question of cost. I do not place it under the heading of 'Cheap,' except in its true interpretation, viz.: as giving the best value for the money expended, because the total price for a first-class Stannos concentric job would not be less than some of the other known systems but, as before stated, I prefer the former as giving the best value."

Leonard G. Tate, A. M. I. E. E., F. E. C. A. (head of a London electrical installation firm, and secretary of the London Electrical Masters' Association, and the Electrical Contractors' Association), says:

"Personally I have done very little with the concentric wiring system. With regard to conduit or casing work, my practice now is to use nothing between heavy gauge screwed conduit and ordinary wood casing. The grip socket systems are, in my opinion, of very little use, and really cost as much to run as proper screwed tubing."

A prominent manufacturer of conduits and fittings expresses himself thus:

"Whilst two or three self-contained wiring sytems, including the concentric system, have made a certain amount of headway in England, they have not made sufficient headway to materially affect the demand for conduit. I am of opinion, however, that they will make better headway in future."

S. L. Pearce, M. I. C. E., M. I. E. E., M. I. Mech. E., F. Amer. I. E. E., chief electrical engineer, City of Manchester, writes:

"Within the last few years a considerable number of installations in the Manchester area have been wired with the Henley twin wiring or Siemens Stannos systems. Concentric systems are not allowed on our supply. The cost of installing either of the above systems is considerably cheaper, and in many instances they are more suitable than steel conduit or the older method of wood casing. A minimum amount of cutting away is entailed, existing decorations are not damaged, the wiring is unaffected by sudden changes of temperature, and is impervious to moisture. Where sunk in plaster, we insist upon steel protecting sheaths being used. Fairly good india rubber tests are generally obtained, but unless wiring contractors install the necessary fittings designed for the above systems, good electrical continuity will not always be secured. It is essential that only competent workmen be employed in the erection of these systems, otherwise faults are likely to be continually developing, and the resultant cost of maintenance therefore becomes heavy. Cab-tyre sheathed cables are recommended, and have been used with very good results in cases where excessive damp and other very trying conditions prevail. It may be cleated to walls by means of saddles, or fixed on porcelain insulators as occasion requires.

"Another cheap method of wiring, suitable for factories, workshops, or buildings of a fire-proof nature, where cables, etc., may be fixed out of reach, is ordinary vulcanized india rubber 600 megohm grade cable, run on porcelain cleats.

"Manufacturers of conduit fittings have recently been endeavoring to devise some cheap form of grip fitting, to replace the present costly method of screwing conduit, and several types have been tried on installations in Manchester with success.

"Our experience in Manchester with the cheaper methods of wiring tends to show that due care has not always been taken to prevent mechanical injury during erection, with the result that several faults have developed, but I am of opinion that there is a great field open for some cheap and reliable form of wiring."

W. W. Lackie, city electrical engineer who is in command of the Corporation electric supply undertaking of Glasgow reports:—"In connection with the Corporation supply in Glasgow we have never encouraged anything but the very best work with the very best material, as we have found that even with these we have an occasional electric fire, and an electric fire as a deterrent in the more extended use of electricity more than counterbalances any advantage accruing from cheap wiring. The other difficulty is that while cheap wiring might be quite suitable for one style of premises, it is quite unsuitable for another, and the problem of differentiating between the building which is suitable and the building which is not suitable for cheap wiring is one which gives rise to no end of trouble and irritation between contractors and the supply authority. We have recently carried out an installation of 1,200 lights for the lighting of a military camp, and bare wires would have sufficed but we have preferred to use vulcanized-india-rubber-covered wires so as to prevent any risk of short-circuit or shock to men getting in contact with the wires."

A. Hugh Seabrook, M. I. E. E., M. I. Mech. E., general manager of the St. Marylebone (London) electricity supply department, secretary of the "Point Fives," and one of the most aggressive spirits in commercially developing domestic electric service who has latterly pushed electric cooking with remarkable success in what is almost entirely residential and shop area, says:

"I have no experience of concentric wiring, as I do not approve of it as at present constructed, and for all cheap wiring work we use twin wire (known as cab-tyre sheathed) or a fire-proof cable with wire armoring. With the increase in the price of labor these methods are now cheaper than conduit. I fail to see any advantage in concentric wiring, either in price or anything else, because if you figure out the price of a job with all the special fittings you have to get, it becomes costly and is found to be a nuisance."

E. H. Freeman, of the electrical contracting firm of Tyler and Freeman, London, records his experience in the following terms:

"The introduction of the cheaper systems of wiring has not affected our business very much, as we have been using

an equivalent system, i. e., the ordinary twin lead-wiring with two conductors in one lead sheath, for many years past. This is now being listed by Henley's as an alternative to their concentric system, and the cost works out about the same for each system of wiring. In the best class of work we think screwed tubing is still used almost universally where conditions allow. We should say that the newer systems of wiring are tending to displace cheap conduit work to a considerable extent, but as we have not used any slip tubing for many years past—thinking it entirely unsatisfactory apart from its condemnation by the Institution of Electrical Engineers, we have not found this result affects our own business."

Report on Concentric Wiring by Committee of National Fire Protection Association.

The Committee on Concentric Wiring, consisting of W. H. Blood, Jr., J. C. Forsyth, Washington Devereux, Dana Pierce, A. H. Paddon, G. S. Lawler, J. R. Strong and H. R. Sargent, has reported to the Electrical Committee of the National Fire Protection Association on the subject of concentric wiring.

The report offers a set of suggested requirements for installations of the type under consideration, and the Committee asks to be continued for further investigation of the subject.

The Committee does not make any recommendation of rules to be included in the National Electrical Code, but suggests that its report be filed with the Secretary of the Electrical Committee of the National Fire Protection Association and with Underwriters' Laboratories, Incorporated, and that copies be furnished applicants upon request.

The Committee says that interest in a system of grounded concentric wiring has arisen chiefly from a desire for a system that is low in cost, easy to install and of good appearance; and from a desire to protect persons against injury by the use of a grounded system having no underground exposed current-carrying parts.

The rules suggested are for experimental and development purposes, are only a partial outline of possible future requirements, and are subject to revision, modification and extension. A system fulfilling the conditions outlined will not necessarily be acceptable. Suggestions for the further development of similar systems are invited.

All appliances and systems, the Committee says, should be submitted to Underwriters' Laboratories for examination and report.

The suggested rules applying to concentric-wire systems are as follows:

A. Must be connected only to normally grounded systems where the difference of potential between any wire and ground is not over 150 volts.

The outer conductor or sheath must be permanently and effectively grounded at or near the point of supply of the concentric wire system and on the house side of the service switch and fuses.

B. Must be used only for branch circuits of not over 660 watts each nor more than 16 sockets or receptacles.

C. Must be used for exposed work only. Must never be run on or in floors or in concealed spaces except where passing directly through floors or partitions. Where passing through a floor, must be carried through an iron pipe extending from the ceiling below to a point at least three inches above the flooring. Additional mechanical protection may be required by the inspection department.

D. Must be continuous from outlet to outlet without splices or taps unless approved splice or tap fittings are to be employed.

E. The radius of the inner edge of any bend to be not less than 3.5 inches.

F. The outer conductor or sheath must be permanently and effectively connected to the grounded supply wire at the point of supply of the concentric system.

G. Must be equipped at every outlet, splice or tap with a fitting approved for this purpose.

The ends of the outer conductor or sheath must be secured at every outlet, splice or tap so as to secure electrical continuity between all portions of the outer conductor or sheath.

No soldered connections shall be made to the outer conductor or sheath at any point, but approved clamping devices or binding posts on terminal plates in fittings shall be used for all tap wires to sockets or other connected fittings.

H. No switches shall be placed in the outer conductor or sheath, and no switches in any part of the system to which the concentric wiring is attached shall be of a type or so installed that the outer conductor or sheath can be disconnected from the grounded wire of the supply system without simultaneously disconnecting the inner wires.

I. Fuses must not be placed on the outer conductor or sheath of the concentric system, nor in the grounded wire of the supply thereto within the building in such a way that their operation can under any condition break the connection of the outer conductor or sheath with the grounded wire of the supply system within the building.

An approved fuse of capacity not larger than 10 amperes must be placed so as to protect the inner conductor of each 660-watt circuit.

J. At all outlets or junction points approved fittings must be used which shall provide for the suitable insulation of the inner conductor and secure electrical continuity of the outer conductor or sheath through the fittings.

K. Where concentric wires enter or leave metal outlet or switch boxes or cabinets, the outer conductor or sheath shall be mechanically and electrically secured thereto by suitable clamps or other approved means.

Where liable to come into contact with water or gas pipes or other grounded metal, the outer conductor or sheath must be effectively connected electrically thereto or insulated therefrom by some reliable means.

L. Must be securely supported at least every 4.5 feet by means of approved clamps.

Construction Rules.

M. Must comply with the requirements of the National Electrical Code rules Nos. 49, 50*a*, *b*, *c*, *e*, *g* and *i*, except that insulation resistance and voltage tests shall be made without immersion and between the inner and the outer conductors.

N. Concentric wires for systems of this type must be of approved form and construction and the inner conductor must be of copper of No. 14, B. & S. gauge.

O. Between the insulation and the outer conductor there must be a firm continuous tape or braid of approved material.

P. The inner and outer conductors must be of copper and the inner conductor must be thoroughly tinned.

Q. The outer conductor or sheath must be so applied as to fit closely and tightly and must be continuous. The conductivity of the outer conductor or sheath must not be less than that of the inner conductor. The completed wire must be of approximately circular section at all points.

Concentric Wire Samples Submitted.

R. S. Hale, chairman of the Committee on the Wiring of Existing Buildings of the National Electric Light Association, has received from manufacturers samples of specially constructed concentric wire. A few feet of hand-made wire, with tinned sheet-copper cover, were submitted by the General Electric Company. This is of similar structure to wire of British manufacture, of which a specimen section was received from Siemens Brothers & Company, Limited, of London, England.

The Simplex Wire & Cable Company, of Boston, Mass., submitted three types of concentric wire. One is composed of No. 14 copper conductor, rubber-covered and armored with 36 strands of No. 26 tinned copper, wound spirally.

Another Simplex sample is covered with two steel tapes wound in opposite directions, and a third is covered with woven brass or copper braid.

Preliminary Report on Standardization of Plugs and Receptacles.

The National Electric Light Association's Committee on the Wiring of Existing Buildings at its recent meeting adopted a provisional report on the standardization of plugs and receptacles, the publication of which prior to the June convention of the Association has been authorized in order to bring it to the attention of all branches of the electrical industry for consideration and comment. The report follows:

The committee was two years ago assigned the task of standardizing plugs and receptacles, so that the purchaser of a small flatiron or other device with a cord and attachment plug* suitable for use on lighting circuits, would find that his purchase could be used on the receptacles already installed in his house as well as on his lamp sockets.

At first the committee made no progress. This was largely on account of patent difficulties, but in addition to these it was found that in some cities underwriters and other inspectors were forbidding the use of receptacles on lighting circuits, and requiring receptacles to be installed on separate circuits. The result was that when a user of a heating device desired to install a receptacle rather than use a heating device from a lamp socket, he found himself deterred by the prohibitive cost involved, if his wireman obeyed the interpretation of the rules, and instead of installing a receptacle he continues to use the heating device from the lamp socket.

In its past reports the committee made some recommendations, which, if adopted by the underwriters, would have obviated this difficulty, but they refused to take any action, and the committee now recommends the following action on the part of the National Electric Light Association.

Plugs and Receptacles for Lighting Circuits Alone Considered.—For the moment we should confine ourselves to the class of small plugs and receptacles suitable for use on lighting circuits.

The line of demarcation at present is 660 watts, or six amperes, at 110 volts.

Plugs and receptacles of larger capacities are chiefly for charging storage batteries, and are being standardized by other committees. In any case they are not considered in this report except as noted.

Articles on List.—The committee has prepared the following list of the small plugs and receptacles. Some of these have in the past been rated as good for higher wattages than would be allowed on lighting circuits, but it is understood that the manufacturers of the articles here listed have agreed to use all reasonable effort to keep their plugs off of any devices taking more current than is allowed on lighting circuits, even if such plugs and receptacles are actually safe with a higher current than the highest permissible load on a lighting circuit. In other words, all the plugs and receptacles in this list will hereafter be nominally rated as good only for 660 watts or less, and as not proper for use on devices that take over 660 watts, so long as this remains the capacity allowed on lighting circuits.

In this report the various types are referred to by the manufacturers' names, on the understanding that this describes them sufficiently for all practical purposes. The output of a given manufacturer may, for instance, include wall receptacles, floor receptacles, separable plugs and receptacles, angle receptacles, etc. They will all be considered as being in this list so long as the manufacturer does not claim for any plug connecting to such receptacles a capacity greater than the capacity allowed on lighting circuits by the National Electrical Code.

Polarity Receptacles and Plugs.—None of these are at present included in the list, and unless included in the list these should in the future be installed on other than the ordinary lighting circuits. There is good reason, however, why polarity receptacles should be included in this list as approved types, provided the manufacturer of such agrees to attempt to keep them off of any device of higher capacity than is allowed on lighting circuits.

Plugs and Large Devices.—It is understood that such plugs (polarity or ordinary) as these firms may make of larger capacity (15 amperes or over) will be made so as not to fit the small-size receptacles.

Re-Rating.—Some of the small-size plugs now made by these firms have in the past been given a rating of 10 amperes, but it is understood that ratings of not over 6 amperes at 110 volts (660 watts) will hereafter be advertised for the small-size plugs and receptacles in this list. This will not involve any change in the design or manufacture.

Future Change of Rating.—The limit of 6 amperes at 110 volts, or 660 watts, is the present limit allowed by the National Electrical Code on lighting circuits. If the limit allowed by the Code should be changed in future, a similar change would naturally be made in the maximum rating of this class of small plugs and receptacles.

Practice of Members.—It is recommended that N. E. L. A. members (both company and individual) refuse to purchase for use on lighting circuits any receptacles or plugs that do not connect to any of the plugs and receptacles on this list.

To Manufacturers.—A complete outfit consists of: A, wall or baseboard receptacles, B, plugs that fit in such receptacles (this including the cap of separable plugs) and also C, of connectors that have on one side an Edison screw plug similar to a lamp base for use in lamp sockets, and on the other side the receptacle for the cap, the connector and cap together making a so-called separable plug. If the output of any manufacturer does not constitute one portion of a *complete* outfit, such manufacturer should take note of the fact that his product will be omitted when final standardization is effected, and should make early arrangements accordingly.

Future Improved Devices.—If any new type of plug and receptacle should be developed or presented to the N. E. L. A. (even if not interchangeable with any of those on the list), the N. E. L. A. should, nevertheless, until further notice, be prepared to add it to the list; but the committee hopes that the progress of the industry and the expiration of patents will lead to the universal adoption of only one type, and that one of the types already in use.

Large Receptacles, or Receptacles for Large Devices not Suitable for Use on Lighting Circuits.—The committee recommends that no outlets other than lamp sockets, Edison screw-base receptacles, or the receptacles on this list be allowed on lighting circuits, and the committee considers that the underwriters and inspectors will be justified in requiring separate circuits, pilot lights, etc., for receptacles not on this list.

Result if the N. E. L. A. Accepts This Report.—The result of acceptance of this report should be a first step towards standardization. The next step will come when any of the plugs and receptacles on this list cease to be made, and give place to better ones, and the final result will be arrived at when only one is left.

On account of the patent difficulties alone it would be undesirable for the committee now to select any one type from the list, but if the holders of patents will only license other manufacturers on reasonable terms, the final standardization of plugs and receptacles (similar to the present standardization of the screw lamp base and socket) will be sooner arrived at.

List.—The ordinary Edison screw-base receptacle is, of course, allowed, and the solid or swivel plug for use in such receptacles or in a lamp socket are, of course, allowed whenever a non-separable plug may be used.

The other types are as follows: Bryant, Chelten, Cutler-Hammer, Federal, General Electric, Hart Mfg. Co. Diamond H, Hubbell, Paiste, Trumbull.

In submitting the report to the Executive Committee of the Associatizon, Chairman R. S. Hale of the Committee on Wiring of Existing Buildings said:

Since the provisional adoption of the report the following has been presented and should for all practical purposes be considered as in the report: National Metal Molding. This will connect with the Hubbell and, of course, the Hubbell will connect with the National Metal Molding. Benjamin has also applied and may possibly connect with one of the others on the list.

I am also glad to state that I understand some of the manufacturers are negotiating among themselves with a view to making their plugs and receptacles interconnectable. Some of the manufacturers whose plugs and receptacles have certain weaknesses are making plans to drop the manufacture of such and instead to adopt one of the other types, all of which will lead towards the standardization of a single type.

This report does not take up particularly the question of polarity receptacles. The importance of this question is before the committee and will be considered at its next meeting.

*In this report "plug" refers to the cap of separable plugs as well as to the whole plug whether separable or non-separable.

English Contractors Adopt Guarantee Scheme.

The Electrical Contractors' Association in England has at last agreed upon a scheme to guarantee the workmanship and material of all of its members, and will put this into operation on October 1 of this year. After that date, every member of the association will have behind him the financial guarantee of the association that the work done by him will be carried out in a satisfactory manner.

This matter has been before the association for a long time, and has involved considerable discussion, but it has finally been adopted in very nearly its original form.

Semi-Annual Convention of the Minnesota Electrical Contractors' Association.

The Minnesota Electrical Contractors' Association held its semi-annual meeting at the Hotel Radisson, Minneapolis, Minn., on Wednesday, January 27. There were about thirty-five of the leading Minnesota contractors in attendance and the papers presented were of unusual interest and value. A closed session, when matters of intimate interest were discussed, was held during the morning, and at luncheon, George B. Muldaur, of the Society for Electrical Development, told of the field operations already instituted by the Society and presented a complete report regarding the successful working out of the Society's plans up to the present time. Mr. Muldaur reported the elimination of a good many insular difficulties attending the relations of the central station, electrical contractor and jobber through the medium of the Society and stated that there was such manifest satisfaction upon the part of the present members that the ranks of the Society were continually gaining in numbers and in strength.

The afternoon session was devoted to the reading and discussion of papers having to do with the practical work of the electrical contractor. The first paper was presented by Russell H. Eddy, of St. Paul. Mr. Eddy discussed progress in construction work and brought to this discussion a very interesting account of the wiring of old houses and flat buildings in St. Paul, using armored conductors. Mr. Eddy preferred the use of armored conductors to rigid conduit, or knob and tube work, because it confined the installation to the apartment of the tenant securing the service. One-half inch armored conductor was run around flush with the picture molding and then fished above the ceiling to the center outlet. Where a gas stub was available, a flat plate was screwed up and made fast with a lock-nut and bushing; where there was no gas stub the flat plate was fastened directly on the plaster, toggle bolts being inserted into the plaster so as to hold across several laths. The use of the flat plate was preferable, Mr. Eddy said, in wiring existing buildings, as it made it unnecessary to clip around the plaster, which would be the case if shallow boxes were used. Another point of importance, to Mr. Eddy's mind, is that the flat plate eliminates the possibility of sand running down into the canopy where the surface of old plaster is broken. Another important element in the use of armored conductor is that it can be installed very rapidly, one journeyman and a helper doing a surprising amount of work each day; a low price can be figured on the job and a good profit made. Another interesting point brought out by Mr. Eddy was that when his bid was submitted to the owner, he presented samples of the armored conductor and the flat plate screwed on, and this seemed to the owner to be so much greater protection from fire than the open system would be that he readily consented to use it in spite of the fact that it cost a good deal more.

F. G. Dustin complimented Mr. Eddy on the neatness of the installation under discussion. He had inspected the installation and said that, to his mind, it was perfectly satisfactory and very desirable installation, although the chief inspector of Minneapolis was opposed to the use of the flat plate.

In reply, Mr. Eddy stated that the objection was probably because a plate of a little greater diameter than the canopy had been used. He had been assured, however, that the Appleton Electric Company of Chicago has placed on the market a plate which would be entirely satisfactory for work of this character. Mr. Eddy also explained that in wiring these apartments, that a drop cloth had been used and that each room had been taken care of at one time, so that the tenant was not inconvenienced in any way and no damage whatsoever was inflicted either upon the building or the furniture of the tenant. The work was facilitated by the use of an H. B. Martin portable bench vise set up on the back porch of the house.

Mr. Dustin presented a review of the progress in the manufacture and installation of wiring devices during the last twenty-five or thirty years. He had an exhibit of these old-time wiring devices and he showed that there have been but few changes in ideas, the difference between the old material and the new being to a great extent the substitution of better insulation and some refinements in design.

A very interesting paper on methods of estimating and presenting some ideas with regard to taking care of unusual installations was presented by R. E. Russell, of W. L. Gray & Company, Minneapolis.

This was followed by a paper by A. W. Lindgren, of the Northwestern Electric Company of Duluth, entitled "Office Forms and Methods of Handling Out-of-Town Contracts."

Clovis M. Converse of the Electric Construction Company, St. Paul, described the progress of securing, entering, forwarding and billing an order. When a job is bid on, the credit of the new customer is first established. If this is satisfactory and it is desirable to continue the work, a construction order is made out which contains the name of the customer, the location of the job and enough descriptive matter to identify the leading features. If it is a big job it is merely referred for descriptive matter to "As per plans and specification." A copy of this construction order is given to the foreman with a labor sheet and on small work the labor sheet is handed to the man in charge of the work, who is held responsible for the filling in of the details. There are two material forms. One for stock taken from the company's supply bins, and one for stock ordered from outside sources. All material coming in from a job is properly credited and all outgoing material checked by the bookkeeping department and cross-checked on the delivery slips by the man in charge of the work. No supplies are sent out or extra parts delivered without a signed order from some person in a responsible position. All correspondence and business forms relating to each job are given an individual number and everything is kept together in a single folder bearing the same number. When the work is completed, all of the work tickets and material tickets are withdrawn from the folder, the cost of material is priced and proper extensions made, the labor and outside expense is figured and extensions made, and all costs and charges assembled and computed on a counting machine. In billing, where the matter is a small item, a blanket bill for time and material is made out. Where the job is a big one, and the customer demands it, time and material are itemized when billing.

In the discussion which followed, W. I. Burgess, of the Burgess Electric Company, Duluth, described a method of keeping tab on the amount of conduit run each week on an out-of-town job. A set of two blue prints are kept rotating; No. 1 is sent out on the job, and the following Saturday morning, No. 2 is sent to the foreman in charge. On the Monday morning following the foreman marks off with a red pencil the work run during the previous week. On the following Saturday morning, No. 1 blue print goes back to the foreman, and on the following Monday morning No. 2 is sent in to the office marked for the work run during that week.

Other papers presented were "The Necessity of Knowing All About a Contract and the Requirements of an Installation Before Completing a Bid," by A. W. Lavalle; by A. W. Jalim, entitled "The Value of Perfect Specifications," and by W. H. Vilett, of the Sterling Electric Company, Minneapolis, entitled "Lines of Credit, Collections and Discounts."

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, City Hall Annex, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. MacColl, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary wishes to apologize for a slip in his last message where, in stating President Day's appointments for the committee on the New York meeting, the name of J. C. Forsyth, of New York, was omitted, as was also the further statement that the President had requested the Secretary himself to act as secretary of that committee.

The Secretary has also been informed by the President that the date for the meeting will be March 23, 24 and 25. The banquet will presumably be held on the evening of March 23.

Headquarters, as has been said, will be at the Hotel Martinique, and it is desired that as many members as possible will plan to stop there, as it makes it more pleasant all round. The hotel is very handily situated at Thirty-second Street and Broadway, and is a very satisfactory and comfortable one.

Notes From the Sections.

The annual meeting of the British Columbia Section was held on Friday, January 8. Officers elected: C. H. Fletcher, city electrician of Vancouver, president; J. C. Digby, assistant city electrician of New Westminster, vice-president; W. A. Oswald, assistant inspector of theaters, Vancouver, secretary-treasurer; H. E. Grant, Vancouver, press secretary; representatives on executive committee, C. H. Fletcher and G. Hubbard, of the N. A. E. I.

Secretary Oswald reports that they expect quite an increase of membership at their next meeting. They have adopted a regular program of discussion and work for the ensuing year and anticipate in every way a very prosperous and valuable season.

The Western New England Section will meet on February 10 at Hartford, President Perry of Hartford, giving a talk in the morning. The details of the meeting have not as yet been reported to the Secretary, who hopes if possible to visit the Section at that meeting.

The Eastern Massachusetts Section met January 21 at the office of the Commissioner of Wires in Boston and gave practically the entire time to the consideration of a bill which is to be presented to the legislature for the licensing of electrical contractors and wiremen. This bill has been prepared by a large committee representing practically all the electrical interests in the state, so far as they would be interested or affected by such a bill. As a result of the meeting the Section voted to appoint a committee to appear at any and all hearings on the bill and state the position of the Section, which was: "Voted that while this Section desires to go on record as in thorough accord with the purposes of this bill, and believes some system of license is necessary to the wellbeing of the business in this Commonwealth, it does not feel that it has any particular reason to press this particudar bill nor any special provisions therein, being entirely willing to accept anything which is worked out by those more immediately concerned so long as it contains the basic principle of licensing and ensures proper supervision of work."

The Secretary recently received a note from Secretary Hannan of the New York Section apologizing for not having more of interest to report and stating it was difficult to get things under way. The Secretary has gathered that the principal difficulty is in finding a large enough room in New York for the members to get into at once and all be able to take part in the proceedings.

In conclusion he desires to say that the two questions printed herewith clean up his desk and earnestly re-requests members to think up some new ones at an early date.

In this connection he may say that he has two or three on his desk which cannot be used as, while interesting, they are not within the scope of our work, one or two being matters of construction which should really go to the laboratories, and the others not germane to the Code.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Master Control Switch.

Question 285. Would the Code allow a master control switch for all or a part of the lights in a residence, independent of all other switches?

Answer 1(P). The Code places no limit upon the number of switches which may be allowed on an interior electrical equipment.

Answer 2(M). There is nothing to prohibit the installation of a master control switch for all or part of the lights, provided it is located between the main fuses and those of the branch circuits.

Answer 3(H). The service switch required by Rule 24*a* is really a master switch and I can see no objection to installing another if desired, provided it is on the building side of the service switch referred to.

Answer 4(F & G). Yes, if the switch

is designed and wired so that the branch circuit fuses are not short-circuited.

Answer 5(B). There is no reason why, under the Code, a master control switch should not be installed for all or a part of the lights in a residence, this switch to be independent of all other switches except the service switch.

Answer 6(U). I know of no rule to prevent it.

Answer 7(S). I find nothing in the Code bearing on this question. I should approve an installation of this kind. The wires from the master switch should not control over 660 watts. If the combined load is more than 660 watts, it should be divided and properly protected.

Answer 8(V). Only in theaters or other buildings used for public assembly.

Answer 9(N). There is nothing to prevent it; in fact, in my own house, I have such a master switch in the front hall for the whole house, and the basement, first floor, second floor, and attic can also be cut off, each independently.

Answer 10(Q). Master control switches are allowed under both conditions in the question. This switch when made in accordance with the Code rules and under Laboratory inspection is always considered safe if properly located and wired.

Answer 11(A). I can see no objection to such a switch. Sometimes a person wishes to open the switch during a thunder shower and cannot open the company's service switch owing to the same being sealed.

Answer 12(R). Yes, if this means an emergency system using three-point switches with a fused emergency leg for each circuit.

Answer 13(O). The Code imposes practically no restriction on the proper use of approved switches. A more definite answer cannot be given to this question, unless it is more clearly worded or accompanied by a wiring diagram.

Answer 14(E). Yes; providing, of course, the circuits were separately fused and the individual circuits did not exceed 660 watts. We frequently find an approved panel with a number of switches connecting circuits to the busses through fuses, with a master switch at the supply end of the busses.

Service Entrance.

Question 286. In my territory two lighting companies are competing for business, often having services in the same building, and it is expected the company last entering shall set its service switch beside the one already in. Am I justified in requiring this under the Code, or does the latter allow the companies to enter at points most convenient to their lines, though far apart in the building?

Answer 1(P). The Code does not require that two independent services shall be placed side by side. However, it is better so to place them where practicable.

Answer 2(M). The only rule of which I know that would apply is the first part of Rule 24*b*.

Answer 3(H). Rule 24*a* makes no reference to point of entrance, as this is usually left to the company furnishing service. It strikes me that the requirement complies with good construction.

Answer 4(F & G). It is the best practice for all concerned to have the service switches in close proximity, although the Code only requires it to be in nearest readily accessible place to the point where wires enter the building.

Answer 5(B). Conditions referred to do not exist in this territory. It would seem advisable, where practicable to do so, to have the switches located under such conditions as to make both services handy of access at the same time, which would necessarily mean that they be located near each other.

Answer 6(U). I know of no rule as to location as long as it is easily accessible to police and firemen.

Answer 7(S). The Code is silent on this question. For convenience the switches should be near together. In case of fire it might make a great deal of trouble if they were a great distance apart.

Answer 8(V). In my opinion you are pursuing the proper course.

Answer 9(Q). The Code does not cover location, only construction and protection. Owners and municipalities, however, very properly may.

Answer 10(N). The Code does not cover this point at all, the only requirement being "nearest readily accessible point to place of entrance." This might be exactly complied with in case of prior company, and palpably contravened in the case of the second. In such a case I should, however, very distinctly hold to the position taken by the questioner. I think it would be of more importance to concentrate the service switches for police and firemen's sake than to strictly follow the other course.

Answer 11(A). The Code is hardly concerned with service entrance. It also depends on whether the municipal inspector specifies service locations, as is frequently the case, or allows the companies to select their own. I think the plan is a good one.

Answer 12(R). You are not justified by the Code; but you are right in many cases in calling for the switches to be in the same place.

Answer 13(E). I do not understand that the Code has jurisdiction in the question raised. So long as the method of making the service entrances and the manner of caring for them within the building are within the spirit and intent of the Code, I do not feel that the Code can be expected to deal with the competitive spirit of two or more public utility companies in the same community.

Answer 4(O). There are no Code requirements governing the matter of the precise location of service entrances into buildings. In this city the problem is solved by the following requirement in the Electrical Section of the City Building Code:

"Be it further ordained, etc., That every building other than a private dwelling in which electricity is used for light, heat or power, shall have the supply wires leading from the street mains enter the building at some convenient location on the ground floor, readily accessible to the occupants of the building, and said supply wires to be provided at this location with main cut-off switches, as few in number as conditions will allow, so arranged that all current for light, heat or power can be cut off from the building."

The Production of Rutile.

The only rutile produced in the United States during 1914 was, as heretofore, that put out by the American Rutile Company at Roseland, Va. The company produced 94 tons of rutile carrying 95 per cent of titanium dioxide and as a by-product 89 tons of ilmenite carrying about 55 per cent of titanium dioxide.

Rutile is used in electrodes for arc lamps, for making ferrotitanium for use in cast-iron and steel, in ceramics and chemicals. Concentrated rutile sells for $50 to $400 a ton.

Public Service Commissions

Conducted by William J. Norton

IDAHO.

The Idaho Power and Light Company was granted a certificate of convenience and necessity authorizing it to furnish electric service in the counties of Twin Falls, Gooding and Lincoln. The decision, rendered January 16, 1915, authorizes the applicant company to enter territory served by the Great Shoshone and Twin Falls Water Power Company, and has the effect of reversing the opinions of the Commission dated February 18, 1914, and November 7, 1914. Before reviewing the decision in the present case it is important that a brief history of the case be given.

In the decision rendered February 18, 1914, in the case of the Great Shoshone & Twin Falls Water Power Company vs. Idaho Power & Light Company, the Commission ordered the defendant to desist from the construction of its system to serve the territory occupied by the Great Shoshone Company and rendered a decision in favor of protection of the established company from needless competition. The defendant applied to the Supreme Court of the State for a writ of review and the same was duly prosecuted in the Supreme Court and a decision rendered June 27, 1914. In this decision the Supreme Court fully reviews the decision of the Commission and defines the scope and intent of the public utilities law. The order made by the Commission was affirmed.

Following the conclusions reached by the court, the Commission again rendered a decision in the matter, dated November 7, 1914, refusing the certificate of convenience and necessity to the Idaho Power and Light Company to enter the territory in question. In this decision the Commission finds that the Great Shoshone company is rendering adequate service and has proved itself willing to meet the suggestions of the Commission for a reduction of its rates.

On December 9, 1914 (a change in the membership of the Commission having taken place), an order was issued again opening the case for rehearing. In the decision of January 16, 1915, the former position of the Commission is reversed. The effect of the latter decision is to permit the entrance of a second utility in the territory in question. The Commission says:

"Having taken our public utility law almost literally from the California law, we are presumed to have adopted also the interpretation theretofore placed upon it by the California Railroad Commission."

The Commission then cites the holding of the California Commission in the case of the Pacific Gas and Electric Company vs. The Great Western Power Company, and says:

"It is urged that the policy above enunciated, if competition were permitted, would result in the ultimate consolidation of competing companies, after a period of more or less fierce competition, whereafter the consolidated utility would claim the right in the courts to receive from the public rates high enough to yield to the company a return on all the property of the original competitors, including the property which had been duplicated and a large portion of which had been 'junked.' This objection is imaginary rather than real. This would be true if 'cut-throat' competition were permitted and typifies the condition of affairs before the enactment of the public utilities law.

"In the first place, this Commission is given the right to establish rates of all utilities, and it shall be the policy of this Commission to see that all utilities will be allowed a just compensation of the value of their property used and useful for the public purpose; they cannot continue to expect the public to pay to them rates high enough to yield unreasonably high returns on the property. So that if a new company should be permitted to enter the territory now served by the Great Shoshone company, competition will exist only as to the kind and character of service to be rendered and the numerous and divers uses to which electric energy may be applied.

"Idaho is a young and growing state, with tremendous possibilities of development, and it seems against public policy that this Commission should take any step that would tend to tie up the unlimited undeveloped water power of this state and thereby retard the development of our resources. The development of this natural resource, lying at our very doors, should be encouraged so that the people may enjoy the privileges and comforts which are rightfully theirs. . . .

"We therefore conclude that the California rule as herein enunciated is the only rational rule for this Commission to adopt. Having adopted a rule in this matter, we must next make the proper application of the facts in this case and determine if they fall within said rule. There are three questions which present themselves for consideration, viz.:

"1. Was the Great Shoshone & Twin Falls Water Power Company rendering adequate service in the field in question at the time of the threatened competition by the applicant herein?

"2. If the service was adequate, were the rates reasonable?

"3. Was and is the territory in question completely served by the Great Shoshone & Twin Falls Water Power Company?"

The Commission, after discussion of the testimony offered, concludes that the

"Great Shoshone company was and is in a position to render reasonably good service to the citizens of the communities in question." In the matter of rates the Commission points out that before the threatened competition, in 1912, the company had in effect a maximum rate of 15 cents, which has been reduced to a maximum of 9 cents at the present time.

"We, therefore, must conclude that the Great Shoshone company at the time the territory in question was threatened with competition, was not furnishing electrical energy to the inhabitants of the various cities, towns, and villages in said territory at reasonable rates."

The Commission, however, does not make any further statements in regard to the reasonableness of the rates at present offered by the company.

"We next come to the third proposition. Was and is the territory in question completely served by the Great Shoshone company? The record shows that the Great Shoshone has constructed 96.87 miles of rural distribution lines, scattered over six counties and radiating out from 18 different cities, towns and villages as distributing centers. From those facts we can hardly conclude that the entire territory of

those six counties was completely occupied by the Great Shoshone company. The California Commission in the case of the Pacific Gas and Electric Company vs. Great Western Power Company, supra, page 212, said: 'But the fact that a power line, for instance, crosses a county and in the immediate vicinity of its line is distributing electricity for power and light purposes, certainly could not lead us to conclude that the entire territory of such county was completely occupied by the existing utility.'

"Another question urged by the applicant was that the Idaho Power and Light Company can furnish power more cheaply than the Great Shoshone company by reason of its smaller investment. Evidence was introduced showing the property cost of the Shoshone company to be something like $4,217,203.84 while that of the Idaho Power and Light Company was $2,192,009.20. These figures were compiled from the annual reports of the companies filed with this Commission. This matter of values or cost was very lightly touched upon and we can hardly give very much weight to the same. We would hesitate considerably before accepting the same as final in a rate-making contest. We are satisfied from the evidence introduced, however, that the Idaho Power and Light Company can furnish power as cheaply, if not more cheaply, than the Great Shoshone company and that is as far as we care to discuss the matter in this case."

"We do not wish to be understood as holding, or intending to hold, that the door of competition will be thrown wide open in this State; but, unless it is shown that the utility desiring to enter a competitive field can give such service as will be a positive and material advantage to the public, it will not be allowed to enter a field already occupied; provided always, that the existing utility is furnishing the public in its territory with adequate service at reasonable rates at the time of the threatened competition. Each case must be decided upon its own particular merits.

"With the findings above set forth and the views herein expressed, the conclusion which must follow is that the order heretofore entered in this case on the original hearing, being Order No. 169, should be vacated and set aside, and that the application of the Idaho Power and Light Company for a certificate of convenience and necessity be granted."

ILLINOIS.

Standards of Telephone Service. The Commission has issued tentative standards of telephone service, and a conference with representatives of telephone companies has been held for the purpose of discussing and criticising the proposed rules from the standpoint of these utilities.

MISSOURI.

Report. The Commission has issued in bound form its first report, containing the decisions of the Commission during the period from April 15, 1913, to September 24, 1914.

OHIO.

Beecher W. Waltermire, of Findlay, O., has received the appointment to succeed E. W. Doty as a member of the Public Utilities Commission. Confirmation of the appointment by the Senate will be withheld until a law is enacted readjusting the salaries of state officials. Pending this action, Mr. Doty, whose term expired February 1, will continue in office.

The Columbus Railway, Power and Light Company. The consolidation of the different electric companies of Columbus into one corporation, the Columbus Railway, Power and Light Company, was approved by the Commission on February 1, 1915.

Diamond Light Company. The Superior Court has refused to dissolve the temporary restraining order preventing the Union Gas and Electric Company from interfering with the wires and conduits of the Diamond Light Company in the basement of the building occupied by the Weber Company. From this building the company is supplying electric service to consumers in the neighborhood, in competition with the Union Company.

The decision of Judge Gorman of the Court of Common Pleas, which held that the Diamond Company may proceed to do business without a franchise, was noted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, November 28, 1914, p. 1043.

PENNSYLVANIA.

Prompt-Payment Discount. The Commission has ordered that all public service companies imposing penalties for failure to pay bills promptly, or allowing discounts for prompt payment of bills, must provide in their posted and filed tariffs, a rule clearly stating the said purpose for which, and the exact circumstances and conditions under which penalties are imposed and discounts allowed, and in the case of allowance of discounts, stating in clear and unambiguous terms whether or not payments mailed, as evidenced by United States postmark, on or previous to the last day of the discount period, will be deemed by the company to be payment of the bill within such discount period.

The Utilities Commission expresses no opinion with respect to the advisability of the continuance or adoption of a rule providing for the mailing of a payment on the last day of the discount period, but issues the ruling merely for the purpose of requiring that such practices as are in vogue, or as may be adopted, shall be clearly set forth in the tariff and applied equally and without discrimination or preference to all shippers, consumers and patrons under like conditions and under similar circumstances, as provided by the public service law. Public service companies are ordered to comply with this ruling on or before March 1, 1915, on five days previous notice to the Commission and the public.

East Berlin Railroad Company. Residents of East Berlin complained to the Commission that the East Berlin Railroad Company refused to furnish service over a certain line. It was conceded at the hearing that the operation of this line has been a financial failure and the respondent contended that for this reason the company had a right to cease exercising the franchise conferred upon it by the State. The Commission points out that the granting of the charter to the company did not give to it a mere license which it can surrender without the consent of the State. When a railroad charter is granted the company secures the right to construct the line mentioned in the charter, and when it has exercised that right it enters into a contract with the State to operate the line until such time as the State has authorized it to discontinue the operation. It is true that the State may look upon nonuse as a forfeiture of the rights granted and proceed to declare the franchise null and void, but until such action is taken the company is bound to perform the service which it undertook when it constructed its line under the powers given it by its charter. In other words, until either the State has forfeited the charter or the company has surrendered the same, the contract between the State and the company must be carried out according to its terms. The order of the Commission is that the East Berlin Railroad Company shall resume service over its line.

WISCONSIN.

Walter Alexander has been appointed by the governor as a member of the Railroad Commission to succeed David Harlowe. For the last five years Mr. Alexander has been a master mechanic with the Chicago, Milwaukee and St. Paul Railroad.

The appointment of Carl D. Jackson as commissioner to succeed John H. Roemer, recently resigned, has been confirmed by the Senate.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENT.

Problem 22.

For the purpose of determining its stray power losses a 20-kilowatt 230-volt shunt generator is direct-connected to a shunt motor. From tests made upon the motor its power output is known for any value of power input and in this manner the power input to the generator can be obtained at any condition of operation. With the generator unexcited the power input to the generator is 680 watts at 1200 revolutions per minute and 550 watts at 1,000 revolutions per minute. With the generator excited from an external source, at a speed of 1,200 revolutions per minute and a terminal voltage of 240 volts, the power input to the generator is 1,320 watts at no load. If the field current is maintained constant and the speed is reduced to 1,000 revolutions per minute, the power input at no load is 1,050 watts. Assuming the armature resistance (hot) between brushes to be 0.12 ohm, find the following generator losses at full load and 1,200 revolutions per minute: (*a*) friction and windage; (*b*) hysteresis; and (*c*) eddy current.

SOLUTION OF PROBLEM 22.

Answer to Question a.

When running without excitation the losses in a generator consist of friction losses in the bearings and brushes, and windage losses associated with the revolving armature. From the data given in the problem the friction and windage loss at full load and 1,200 revolutions per minute is 680 watts, since the magnitude of the load affects the friction and windage loss but little and the machine is being run under test at the rated speed.

The magnetic polarity of any point on the armature core of a dynamo reverses regularly as the machine rotates, the number of cycles, or double reversals, per revolution being equal to the number of pairs of field poles. Assuming that each molecule in the armature core is magnetized permanently (Ewing's theory of magnetism) the reversal of the magnetic polarity at any point on the armature must be due to the rotation of each molecule about its axis. Following this hypothesis the hysteresis loss in a rotating armature is attributed to the frictional losses attending the rotation of the magnetized molecules. Since the frequency of the magnetic reversals in the armature of a given machine depends upon the rotational speed of the armature the hysteresis loss will vary directly with the speed, this theory being verified to a close degree by experiment. The effect of other factors upon the hysteresis loss (P_h) is shown by

[37] $$P_h = KVfB^{1.6}$$

where K is a constant depending essentially upon the kind of iron or steel used, V is the volume of the armature core, f is the frequency of the magnetic cycles and is proportional to the rotational speed of the armature, and B is the magnetic flux-density in the armature.

In Problem 9 it was stated that when a filament moves through a magnetic field an emf. is generated in the filament; the magnitude of this emf. is given by [27]. Since each filament in the core of a rotating armature cuts magnetic flux during some part of a revolution, an emf. is generated in the armature core which causes currents, called eddy currents, to flow in the iron. This circulation of current in the armature core is accompanied by an eddy-current loss which by [20] is proportional to the square of the current. Since the power loss is proportional to the square of the current and the current is proportional to the generated emf. and therefore to the speed, the power loss must be proportional to the square of the speed. The law does not hold in the case of high-speed machines, since the reactance (see Problem 52, Alternating Currents) of the armature core at high speeds is not negligible and varies with the speed. In most cases, however, the square law holds to a fair degree of accuracy. The effect of other factors upon the eddy-current loss (P_e) is shown by

[38] $$P_e = KVt^2f^2B^2$$

where K is a constant depending essentially upon the resistance of the iron, V is the volume of the iron, t is the thickness of the armature laminations (explained below), f is the frequency of the magnetic cycles and is proportional to the rotational speed of the armature and B is the magnetic flux-density in the armature.

Designating the hysteresis loss by P_h, the eddy-current loss by P_e, the friction and windage loss by P_f and the power input of an unloaded separately excited generator by $S.P.$ we may write

[39] $$S.P. = P_f + P_h + P_e.$$

The summation of these losses is called the stray power of the generator.

From the data given in the problem, since the power input at 1,200 revolutions per minute is 1,320 watts and the friction and windage loss is 680 watts, we may substitute in [39] as follows:

(1) $$1{,}320 = 680 + P_h + P_e$$
$$\text{or } 640 = P_h + P_e$$

Since no other factor contained in [37] and [38] is changed but the speed, the hysteresis loss at 1,000 revolutions per minute will be $1{,}000\,P_h/1{,}200$, or $0.834\,P_h$, and the eddy-current loss will be $1{,}000^2P_e/(1{,}200)^2$ or $0.696\,P_e$. The power input and friction and windage loss at 1,000 revolutions per minute being 1,050 watts and 550 watts respectively, we may write

(2) $$1{,}050 = 550 + 0.834P_h + 0.696P_e$$
$$\text{or } 500 = 0.834P_h + 0.696P_e.$$

Solving (1) and (2) for P_h and P_e we have $P_h = 394$ watts and $P_e = 246$ watts.

Answers to Questions b and c.

The above values of the hysteresis and eddy-current losses being found at 1,200 revolutions per minute, it only remains to show that they also hold for the conditions of full load or more directly to show that the flux-density in the armature during the test was the same as it would be if the machine were running at full load. At any given speed the armature voltage [28] is proportional to the flux-density in the air-gap. The full-load line current of a 20-kilowatt, 230-volt generator is 20,000/230 or 87 amperes. Assuming that the field current equals 3 per cent of this, or 2.6 amperes, the armature current at full load [13] will be $87 + 2.6$, or 89.6 amperes. The armature voltage at full load [3] then equals $230 + 89.6 \times 0.12$, or 240.7 volts. Since the armature voltage during the test was 240 volts, the flux-density in the air-gap approximated the full-load conditions very closely. Hence the hysteresis and eddy-current losses at full load and 1,200 revolutions per minute are given by the above values, 394 and 246 watts respectively.

Since the efficiency of a dynamo depends in part upon the magnitude of the stray power losses, it is important that each of the constituent losses be reduced to a minimum. The friction loss in the bearings is made as low as possible by care-

ALTERNATING CURRENTS.

Problem 72.

A three-phase, 3,500-kilovolt-ampere, 2,300-volt alternator is operated in parallel through transformers with a three-phase, 5,000-kilovolt-ampere, 6,600-volt alternator. The first alternator has 36 poles and is driven by a reciprocating engine whose governor is adjusted so that the speed falls from 204 revolutions per minute at no load to 196 revolutions per minute at full load. The other alternator has 30 poles and is driven by a water turbine whose governor is adjusted so that the speed falls from 244 revolutions per minute at no load to 237 revolutions per minute at full load. (*a*) For what total load delivered will the frequency be 60 cycles? (*b*) What is the greatest load that can be delivered without overloading either alternator? (*c*) What is the load on each when they deliver a total load of 7,500 kilowatts? (*d*) What total load will they divide in proportion to their ratings? (*e*) If the governor on the water turbine is readjusted so that the alternators will divide a load of 8,500 kilowatts in proportion to their ratings, how will they divide a load of 5,000 kilowatts?

ful construction of the bearings and by liberal lubrication. The friction loss at the brushes is reduced by diminishing the pressure of the brushes on the commutator as much as possible without interfering with the commutation or introducing too great a voltage drop between the commutator segments and the brushes. It is not desirable in general to reduce the windage loss because the fan action of the armature serves to keep it cool. A minimum hysteresis loss is obtained by using a certain grade of steel; an annealed steel containing silicon gives the best results. The eddy-current loss is reduced by adding elements to the steel which increase its resistance without destroying its magnetic properties (silicon aids in this manner) and by building the armature up with thin sheets, called laminations, which are assembled along the shaft, the laminations lying perpendicular to the shaft. The faces of the laminations are usually lacquered to increase their contact resistance.

SOLUTION OF PROBLEM 72.

Answer to Question a.

The power outputs of individual alternators which are operating in parallel is for all practical purposes determined solely by the speed-load characteristics of the prime movers which drive them. Except for the slight influence of small changes in the core and copper losses, the characteristics of the alternators themselves play no part in determining the division of the load between them. In this respect they are quite unlike direct-current shunt generators. For example, if the latter are operating in parallel the load may be shifted from one to the other by increasing the excitation of the one and lowering that of the other. With alternators a similar change in the excitations will merely alter the phase relations of the armature currents but will produce no appreciable change in their power outputs.

The reason for the difference in the two cases is this. With direct-current generators there is no definite relation that need exist between their speeds. Alternators, however, must run at such speeds as to make their frequencies the same. That is, it would not be possible to operate alternators in parallel whose frequencies varied from each other in the least. If they were forced to do so they would periodically go through a condition of short-circuit, at which time the line voltage would of course be zero and the armature currents would be several times their full-load values. The entire solution of problems like the present one, then, depends on the fact that the frequencies of the two alternators must be equal.

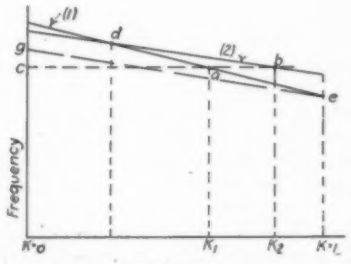


Fig. 26a.

The no-load frequency of the first is

By [41a] $f=36\times204/120$
$=61.2$ cycles.

The full-load frequency is

$f=36\times196/120$
$=58.8$ cycles.

The no-load frequency of the second is

$f=30\times244/120$
$=61.0$ cycles.

The full-load frequency is

$f=30\times237/120$
$=59.25$ cycles.

Fig. 26a is a rough plot of these speed-load characteristics. The ordinates are frequencies and the abscissas are in fractions of the full-load outputs of the alternators. The frequency, f_1, for any fraction, K_1, of the full load of the first alternator is equal to the frequency at no load less the drop in frequency which is caused by the load and which is proportional to it. This drop in frequency from no load to full load is 2.4 cycles. For any fraction of full load, such as K_1, it would be $K_1\times2.4$ cycles. The expression for the frequency, f_1, of the first is then

$$f_1=61.2-2.4K_1 \quad \ldots\ldots\ldots\ldots (1)$$

Likewise the expression for the frequency, f_2, of the second alternator is

$$f_2=61.0-1.75K_2 \quad \ldots\ldots\ldots\ldots (2)$$

If the frequency is to be 60 cycles both f_1 and f_2 must equal 60.

$60=61.2-2.4K_1$
$K_1=(61.2-60)/2.4$
$=0.5.$

That is, the first alternator is delivering one-half of its full load, or 1,750 kilowatts.

$60=61.0-1.75K_2$
$K_2=(61.0-60)/1.75$
$=0.571.$

The output of the second alternator is

$0.571\times5,000=2,855$ kilowatts.

The total load delivered at this frequency of 60 cycles is

$1,750+2,855=4,605$ kilowatts.

Answer to Question b.

The load on each alternator may be found by graphical construction as shown in Fig. 26a. Draw a horizontal line, c b, through the chosen value of the frequency. The fraction of full load that each alternator delivers is found at the intersections of this line with the characteristics. Thus the first alternator would deliver the fraction K_1 of its rated load and the second would deliver the fraction K_2 of its rated load. From no load up to the point d the characteristic of the first is above that of the second. Beyond the point d, however, the characteristic of the second is above that of the first. Fig. 26a readily shows that the alternator which is driven by the prime mover with the higher characteristic takes the greater share of the load. In this case as the load is increased the second alternator will reach the condition of full load before the first. The greatest total output that can be delivered without overloading either will be that at which the second alternator is delivering its rated load. That is, $K_2=1$. Putting this value in equation (2) gives:

$f_2=61.0-1.75$
$=59.25.$

Putting this value of frequency in equation (1) gives

$59.25=61.2-2.4K_1$
$K_1=(61.2-59.25)/2.4$
$=0.812.$

The output of the second is 5,000 kilowatts. The output of the first is $0.812\times$

3,500, or 2,840 kilowatts. The total output is 7,840 kilowatts. This is about 92 per cent of their combined capacities.

Answer to Question c.

The expression for the total load is

$$P_0=3{,}500K_1+5{,}000K_2.$$

Since the frequencies of the two alternators must be equal we can equate equations (1) and (2).

$$61.2-2.4K_1=61.0-1.75K_2$$

$$\text{or } 0.2-2.4K_1+1.75K_2=0 \quad \ldots\ldots (3)$$

$$\text{or } K_2=(2.4K_1-0.2)/1.75.$$

This equation shows the relation between the fractions of full load that each alternator delivers.

Substituting this value of K_2 in the equation for the total output gives

$$7{,}500=3{,}500K_1+(2.4K_1-0.2)5{,}000/1.75$$
$$=3{,}500K_1+6{,}860K_1-571$$

from which $K_1=0.779$.

The output of the first alternator is

$$P_1=0.779\times 3{,}500$$
$$=2{,}730 \text{ kilowatts}$$
$$P_2=7{,}500-2{,}730$$
$$=4{,}770 \text{ kilowatts.}$$

Answer to Question d.

When the alternators deliver loads that are in proportion to their ratings $K_1=K_2$. At the point d, where the characteristics cross, each alternator will deliver the same fraction of its full-load output. The relation between K_1 and K_2 for any load is shown in equation (3).

If $K_1=K_2$ we have

$$0.2-2.4K_1+1.75K_1=0$$
$$K_1=0.2/0.65$$
$$=0.315.$$

The output of the first alternator is

$$P_1=0.315\times 3{,}500$$
$$=1{,}080 \text{ kilowatts.}$$

The output of the second alternator is

$$P_2=0.315\times 5{,}000$$
$$=1{,}540 \text{ kilowatts.}$$

The total output is 2,620 kilowatts.

Answer to Question e.

In practice the method employed to shift the load from one alternator to another when they are operating in parallel is one of governor adjustment entirely. If it is desired to make an alternator take more load, the governor is adjusted so that the speed-load characteristic is raised. If the alternators are to divide a given load in proportion to their capacities, the speed-load characteristics should be adjusted so that they will intersect at the required point. In this case the load of 8,500 kilowatts is the sum of the rated capacities of the two alternators, so that each alternator should deliver its rated load at the same time. That is, the characteristics should intersect at the point where $K_1=K_2=1$. If the governor of the second is adjusted to bring this about it will shift the characteristic approximately parallel to itself until it passes through the point e. The altered characteristic, ge, will have the same drop in cycles from no load to full load as it did before, but the frequency at no load will now be

DIRECT CURRENTS.

Problem 23.

Given the following data regarding a 20-kilowatt, 230-volt, compound (long shunt) generator: terminal voltage constant at all loads without adjustment of excitation; speed, 1,200 revolutions per minute; resistances (hot) of the armature between brushes and of the series field, 0.12 ohm and 0.005 ohm, respectively; normal shunt-field current, 2.6 amperes; power input to generator at no load (terminal voltage 241 volts and shunt-field current 2.8 amperes), 1,995 watts; power input to generator at no load (terminal voltage 235.5 volts and shunt-field current 2.7 amperes), 1,928 watts.

Find the efficiency of this machine (*a*) at full load and (*b*) at half load. What per cent of the input to the generator at full load is lost in (*c*) stray power, (*d*) heating the armature winding, (*e*) heating the series-field winding, and (*f*) heating the shunt-field winding?

ALTERNATING CURRENTS.

Problem 73.

Part I.—Two three-phase, 1,500-kilovolt-ampere, 5,500-volt alternating-current generators of the same design are operating in parallel. They are driven by prime movers whose governors are at first (in questions *a* and *b*) adjusted to give the same speed-load characteristic. The effective resistance and synchronous reactance of each generator are, respectively, 0.37 and 8.3 ohms per phase. The armature windings are connected in star. These generators deliver a total constant load of 2,400 kilowatts at a power-factor of 0.8 and their rated voltage.

(*a*) If the excitations are adjusted so that the armature currents are in phase, what are the excitation voltages in each and how do the armature resistance losses compare with their full-load values? (*b*) If the excitation of one is reduced and that of the other is increased until the first operates at a power-factor of 0.95 (lagging) what are the excitation voltages and how do the armature resistance losses compare with their full-load values? (*c*) If the governors of the prime movers and the excitations of the alternators are now adjusted so that the first delivers 1,500 kilowatts at unit power-factor, at what power-factor does the other operate? Compare the armature resistance losses in each with their full-load values. Draw a vector diagram showing the excitation voltages of each.

(*d*) With the governors still set as in the preceding question, the excitations are adjusted so that the alternators operate at the same power-factor. What are the armature currents in each alternator? Compare the armature resistance losses with their full-load values. Draw a vector diagram showing the excitation voltages of each.

Part II.—An alternator which has a capacity of 1,500 kilovolt-amperes is operated in parallel with one which has a capacity of 1,000 kilovolt-amperes. If they are delivering a total load of 1,800 kilowatts at a power-factor of 0.75, what are the proper conditions of operation—in regard to power output and power-factor—for each alternator? What adjustments would you make to bring these conditions about?

Solutions of the above problems and two new problems will be printed in the next issue.

$$58.8+1.75=60.55 \text{ cycles.}$$

The frequency for any fraction of full load such as K_2 will now be

$$f_2=60.55-1.75K_2.$$

In order to find the division of the load of 5,000 kilowatts apply the same method as was used in **Question c.** Since the frequencies must be the same

$$61.2-2.4K_1=60.55-1.75K_2$$

$$\text{or } 0.65-2.4K_1+1.75K_2=0.$$

$$K_2=(2.4K_1-0.65)/1.75.$$

Since the total load is 5,000 kilowatts we may write that

$$5{,}000=3{,}500K_1+5{,}000K_2.$$

Substitute in this equation the value of K_2 in terms of K_1 just found. This gives

$$5{,}000=3{,}500K_1+(2.4K_1-0.65)5{,}000/1.75$$

$$=3{,}500K_1+6{,}860K_1-1{,}860$$

from which $K_1=0.662$.

The output of the first alternator is

$$P_1=0.662\times 3{,}500$$

$$=2{,}320 \text{ kilowatts.}$$

The output of the second alternator is

$$P_2=5{,}000-2{,}320$$

$$=2{,}680 \text{ kilowatts.}$$

The fraction of full load that it delivers is

$$K_2=2{,}680/5{,}000$$

$$=0.536.$$

The first is operating at a greater percentage of its full-load output. This agrees with the diagram.

The division of load between alternators in parallel is altered by governor adjustment alone. With fixed governor setting the phase and magnitude of the armature currents may be varied over a wide range by altering the field currents. This effect will be discussed in the next problem.

Pittsburgh Convention of Technology Clubs Association.

The 1915 annual convention of the Technology Clubs Association, which is the affiliated organization of alumni of Massachusetts Institute of Technology, will be held at Pittsburgh, Pa., on February 19 and 20. The reunion entertainment, and other arrangements, are being perfected by the special committees of the Pittsburgh Association, of which H. A. Rapelye, Oliver Building, Pittsburgh, is local secretary. Elaborate arrangements are being made, and a large attendance is expected. On Friday evening a smoker will be given at the University Club, and on Saturday evening the annual banquet will be held.

Chicago Jovian League.

L. F. Meisner, Jr., of the Edison Storage Battery Company, interestingly described the nickel-iron battery at the meeting of the Chicago Jovian League, on February 1. Mr. Meisner had samples of the various parts of the battery on display and was called upon to answer many questions relative to details of battery construction and operation.

Northern White Cedar Association Holds Annual Convention.

For the nineteenth time, the members of the Northern White Cedar Association met in annual convention, this year at Minneapolis, on January 26 at the Hotel Radisson.

President, L. A. Page, Jr., Minneapolis, presided and the following firms were represented: Bell Lumber Company, Minneapolis, M. J. Bell; Crawford Cedar Company, Menominee, Mr. Crawford, William Patch, Mr. Worth; Duluth Log Company, Duluth, Mr. Blackmyer; Erickson & Bissell, Escanaba, Mr. Davis; Larson Brothers Lumber Company, Minneapolis, Messrs. Russell and Thyren; McCulloch & Moss Lumber Company, Minneapolis, W. C. Moss; MacGillis & Gibbs Company, Milwaukee, J. E. Gerich; Learned Cedar Company, Minneapolis, C. E. Learned; National Pole Company, Escanaba, A. D. McIntyre, H. W. Reade; Naugle Pole & Tie Company, Chicago, A. T. Naugle, Joe Naugle, Mr. Lafean; Page & Hill Company, Minneapolis, L. A. Page, Jr., L. L. Hill; T. M. Partridge Lumber Company, Minneapolis, T. M. Partridge, H. F. Partridge; Pendelton & Gilkey, Minneapolis, H. Andereson, H. S. Gilkey; St. Croix Pine and Cedar Company, Blackduck, James Sullivan, J. C. Kolliner; C. P. Tinkham, Milwaukee, C. P. Tinkham; Valentine-Clark Company, Minneapolis, L. A. Furlong, E. L. Clark; White Marble Lime Company, Manistique, W. B. Thomas; Wisconsin Land and Lumber Company, Hermansville, P. H. Knolk; Virginia and Rainey Lake Company, Virginia, Mr. Berger.

President Page delivered the following address:

"In looking over the Rules of Order adopted in the Constitution of our organization, I find that one of the requirements of the president of this Association is to give an address. Just what was the intention by the order it is hard for me to understand, but lest I should fail in carrying out your instructions, I am now going to fulfill my obligation.

"This obligation is exceptionally difficult for me to perform, owing to my brief contact with the work. However, in going over the record of the year's work, it is very evident that there has been a great deal of work done and a great deal projected from which the members of the Association will receive considerable benefit.

"The Forest Products Exposition at Chicago and New York represented the first engrossing activity of the Association. It was thoroughly discussed at our last annual meeting at Escanaba, Mich., and if the discussion is correctly recalled by me, we entered the exposition by way of displaying our products as our first step in the much felt need of publicity for cedar. Our arguments are still good as to the need of bringing our products before the users of cedar in order to meet the arguments put forth by manufacturers of substitutes, but I feel confident that it is the universal opinion of your committee in charge of this exhibit, that we failed in this venture in that we did not get to the real users of cedar.

"This was our first step and while we may have failed in the direct results, we have gained a very decided indirect result in having our attention focused upon the absolute necessity of concerted action against the substitutes of our product.

"Millions of dollars are being spent today in an effort to force various substitutes upon the public and if we do not meet the situation in a determined way, we shall all suffer.

"Therefore, while the entering into the exhibitions in Chicago and New York did not directly benefit us, we were so stimulated that a special committee was appointed by Mr. Benham for the investigation of the conditions in relation to substitutes.

"Some very interesting and important facts were developed by the various investigators. It was hoped that their results could be placed before the members in the form of a pamphlet, but the problems were so confounding that the work of all the committees could not be completed in time. The reports of these committees will be given to the members later in the order of business and I would suggest that their work be approved and ordered published for the benefit of the industry.

"The merits of piling and pulpwood have not been investigated as the directors felt that not enough benefit could come to the members from it. However, if it is so desired, it can still be done.

"Another result of our step into publicity of our products was the formation of a committee to look after the exhibiting of our cedar at the various State fairs and other conventions which may be deemed desirable by the board of directors. H. S. Gilkey, chairman of this committee, will give you in detail, later, the possibilities in connection with this phase of work as he sees it and has experienced it this year.

"To my mind, if the Association has done nothing more this year than to start this work on the publicity of our products, we could have felt that our existence was justified, but this was only one phase of our activity.

"After much discussion at the summer meeting held at Deer River, Minn., June 12, 1914, it was decided that the constitution and by-laws had become outgrown, which fact, together with the change of name, necessitated the appointment of a committee for the revision of our constitution and by-laws. Mr. Furlong, together with T. M. Partridge and H. S. Gilkey, have given much thought to this work and your careful consider-

ation of this very important report is urgently requested.

"Since having had our present secretary, Mr. Boucher, we who have been closest in touch with his office have many times realized how fortunate we were in having a man with such expert knowledge of railroad matters. It has never been more important than this last year, as there have been many threatening conditions presented, concerning which your railroad committee has found his expert advice of extreme importance. H. F. Partridge, chairman of this committee, will review this work and I would ask that all members note the great amount of work and the results obtained, as it is of importance to you all.

"These represent the fields of greatest activity for the past year and I feel sure that you will all agree, when you have heard the reports of your committees, that much sacrifice has been made by your servants and a great deal of genuine benefit given to us all.

"Our membership since the last annual meeting has been increased by the firms of Larson Brothers, of Winthrop, Minn., C. P. Tinkham, Milwaukee, Wis., and the Virginia-Rainey Lake Company, Virginia, Minn., all of which we heartily welcome and earnestly hope for close affiliation as it is only by active co-operation that this Association may be of mutual benefit.

"We have lost, by resignation, L. K. Deal Company, and C. H. Worcester Company.

"There are no words which can express the sorrow we all suffered by the death on July 27, of last year, of our president, J. W. Benham, and our member, W. P. Bowring. Few of the members knew Mr. Bowring well, but you all know the sterling character of your president, Mr. Benham. We have suffered keenly, not only as an Association, but as individuals, as a character such as his, is but seldom among us. His memory still remains as an inspiration to us all. At a special meeting of the directors, resolutions were drawn and spread upon the minutes of the Association. Copies were sent to their families and to the companies with which they were respectively connected.

"No address of your president would be complete without a remark as to the business outlook for the coming year, so I will attempt to give a normal interpretation of the abnormal situation. The conditions have been a severe strain upon our industry. The war has produced a stagnation in all lines and will continue to hold up business for some time. The crest of depression seems to have passed, however, if the financial reports are to be believed, but the country is still far from normal. There will undoubtedly be a gradual awakening of business which should affect the post and short pole trade first. We hope this will be good this year.

"A careful study of the stocks on hand, as shown by the annual report, indicates no shortage of stocks to take care of the probable demand. It has been the salvation of our condition, if such salvation can be yet claimed, that our production for this year is so materially lessened. On the whole, we can safely look forward to a general resumption of business in all lines, coming gradually but surely.

"In closing, I wish to thank all the members of the committees for their ardent and enthusiastic support of all matters pertaining to the betterment of the Association's affairs. The Association is worth only as much as we want to make it, but with such support as has been given this year, there will be an increasing benefit accruing to us all."

The report by Secretary Boucher was presented as follows:

"The year of 1914 has been a particularly busy one for our Association, mainly because of agitation on the part of the railroads and increased activity of our members. Much time was consumed by the secretary's office in arranging data for use as evidence at the various hearings, the result of which will be made known to you by the committee chairman.

L. A. Page, Jr.

L. A. Page, Jr., the new president of the Northern White Cedar Association, is the president of Page & Hill Company, Minneapolis. Mr. Page was born at Plymouth, Iowa, July 24, 1878. He was educated at the public schools of Mason City, Iowa, and graduated from the high school in 1896, and from the University of Minnesota in 1900. He engaged in the retail lumber business from 1901 to 1903, and entered the cedar business in 1903. Mr. Page served the unexpired term of president on the death of Mr. Benham. His administration was so successful that he was the unanimous choice for president for the ensuing year. Mr. Page is an executive of unusual ability, is very popular among the cedarmen, and while of a modest and retiring disposition, he has been acknowledged a leader in every community where his business or social activities have found him. When a student at the University of Minnesota he was a star football player on the championship team.

"During May a new reference book was published, and in October a reissue of the rate-book was made, the distribution of which is proceeding as usual with a good demand by the general public, the price to whom is $1 each, and 25 cents to members will amply cover the cost of compilation. Five inspections were arranged and satisfactorily performed.

"Several changes in tariffs affecting the movement of cedar products, the subject of complaints by members were secured. A transit privilege was added to the tariff of the M. & I. to points on the Midland Continental; extension of through rates was secured from Great Northern points to the Northgate Branch in North Dakota. The minimum weights were reduced from Canadian Northern points to Chicago and rate points; minimum weights were reduced from points on the Northwestern in Wisconsin to points on the Milwaukee in Wisconsin; provision for double loads was added to the Great Western tariff from the Twin Cities; of the matters still in hand is the restoration of lower rates on poles from Northern Missouri junctions to Texas, which will make possible lower rates to Texas. The adjustment of rates from the M. & I. to Texas which are now in effect on an unlawful basis; the publication of rates from Great Northern points to points on the Surrey cut-off in North Dakota, the last of which has been promised, will be accomplished soon. The publication of a reasonable basis for rates to the Dakotas from the D. W. & P. in northern Minnesota; the publication of through rates to points on the Puget Sound lines of the Milwaukee; the reduction of minimum weights on cedar piling; the reduction of rates on tamarack ties from the M. & I., are some of the things accomplished.

W. B. Thomas, treasurer of the Association, reported the finances in a flourishing condition.

The outcome of discussion precipitated by E. L. Clark, reporting for the committee in charge of the exhibit at the Forest Products Exhibition held at Chicago and New York early last year, was a tentative proposal of establishing a permanent fund for the purpose of exhibiting white cedar products, which in view of the attitude of competing substitutes was considered imperative.

The committee consisting of Messrs. Hill, Gerich and Thomas appointed to investigate the superiority of cedar products over substitutes, consumed the entire afternoon, covering in turn poles, posts, ties and shingles. The consensus of opinion was that thorough co-operation between producers and distributors and distributors and consumers, was absolutely essential to the advancement of the industry. It was pointed out that publicity of the merits of northern white cedar products was most desired and means adopted to secure such an end. The committee was continued and its accomplishments highly commended. It

is the purpose to eventually compile the data developed for distribution through the channels from which the most benefit will be derived.

One striking feature in connection with the investigation of cedar posts, was a test vote taken by an Iowa farm paper. A great number of replies received from farmers, who are the actual users, showed that the white cedar post was an overwhelming favorite.

W. B. Thomas, of the White Marble and Lime Company, Manistique, Mich., in covering the shingle proposition, related how this product was being legislated against in various cities by so-called fire-prevention organizations which it has been found were usually promoted by producers of roofing substitutes; investigation by manufacturers of shingles proved, from records of the City of Milwaukee, that the proportion of fire in frame or wooden structures, was but one for every fifteen in structures of brick, stone and cement. Grand Rapids, Mich., showed a similar proportion and at Toledo, O., the variation was still wider. The decline in production and loss of prestige of white-cedar shingles was ascribed to the inactivity of the manufacturers themselves.

To amend for the past and prepare for the future, the committee, headed by Mr. Thomas, was delegated to represent the Association at the meeting of the Forest Products Federation, to be held at Chicago on February 24 and 25.

Mr. Gerich, of McGillis & Gibbs, covering the tie situation, stated that lack of co-operation among producers had resulted in the loss of prestige previously held by the cedar tie. The present market, he stated, was also affected by the low price of oak ties, and a poor quality of cedar being produced, has given the product a black-eye with the railroads. It was his information that several years ago, when cedar ties were large, they were then a favorite of users.

Mr. Gilkey, of Pendelton & Gilkey Company, Minneapolis, Minn., emphasized the fact that the consumer should always be considered in the distribution of cedar products and given all that he pays for, defective stock should not be shipped and business principles more rigidly adhered to.

The feeling was expressed that complaints of dealers were frequently actuated by poor shipments. J. C. Kolliner, of the St. Croix Pine and Cedar Company, gained support of those present in a plea that members should aim to make only shipments that would create a standard of quality, thus insuring to patrons of the Northern White Cedar Association a product unexcelled.

In the evening a banquet was given in the Empire room at the Radisson Hotel, at which 50 plates were served. The usual speeches and toasts were given, featured by a parody on "It's a Long Way to Tipperary" reminiscent of the midsummer meeting at Prohibition City, in which all joined. Joe Naugle, of Bemidji, rendered the old favorite "Old Black Joe."

At the Wednesday morning session, Mr. Furlong submitted a draft of an amended constitution and by-laws which was adopted.

Mr. Moss, of the McCulloch & Moss Lumber Company, Minneapolis, rendered a report on the matter of weighing cars at Bemidji, Minn., and expressed the desire that other members would make use of this arrangement which had proven very beneficial and suggested that the Association would attempt to duplicate the work outlined at other vantage points if conditions warranted.

E. L. Clark, of the Valentine & Clark Company, Minneapolis, speaking for the Insurance Committee, related his experience in acquiring standard insurance at very favorable rates in which other members were invited to participate.

L. L. Hill, of the Page & Hill Company, Minneapolis, covered the work of the Legislation Committee during the year.

H. F. Partridge, of the T. M. Partridge Lumber Company, Minneapolis, Minn., covered the work of the Railroad Committee, told of the good accomplished in the reduction of minimum rates throughout Central Freight Association territory; the participation in the Missouri River Rate Case, a favorable decision in which will greatly extend the trade territory of white cedar; the unsuccessful participation against the advance of rates to the Twin Cities and Head of the Lake District from adjacent territory; activity in connection with a formal complaint involving weighing of freight at Bemidji, Minn., and negotiations with a view to increasing the allowance for stakes used on open cars. It was decided that the latter subject should be brought before the Interstate Commerce Commission at a formal hearing as promptly as possible, as this seemed the only way of securing what shippers feel due.

A vote of thanks was tendered the committee for the good work done.

Mr. Gilkey reported for the Inspection Committee and stated that this feature had not proved as valuable as it should, but he could not place the blame. Again he emphasized the necessity for fairness to the dealers. On his motion the new committee was empowered to revise the specifications with a view to removing objectionable features.

Mr. Thomas, for the Tie Committee, stated that the year 1914 had proven decidedly unsatisfactory; that railway companies had withdrawn their plans, sought to avoid contracts and used questionable methods to defeat deliveries.

The following officers were elected:

President, L. A. Page, Jr., Page & Hill Lumber Company, Minneapolis.

Vice-president, H. F. Partridge, T. M. Partridge Lumber Company, Minneapolis.

Treasurer, W. B. Thomas, White Marble and Lime Company, Manistique, Mich.

Secretary, N. E. Boucher.

Directors: J. E. Gerich, McGillis & Gibbs Company, Milwaukee; M. J. Bell, Pell Lumber Company, Minneapolis; William Patch, Crawford Cedar Company, Menominee; L. A. Furlong, Valentine & Clark Company, Minneapolis.

Baltimore Consolidated Section Meeting.

At the fourth meeting of the 1914-15 season of the Consolidated Gas, Electric Light and Power Company Section of the National Electric Light Association on the evening of January 20, in the auditorium of the New Y. M. C. A. Building, Baltimore, Md., the speaker of the evening was Washington Devereux, chief of the Board of Fire Underwriters of Philadelphia, and First Tribune of the Philadelphia Jovian Order.

Mr. Devereux's talk on "Impressions of Thirty-Five Years in the Electrical Industry and a Forecast of Its Future" was full of interesting facts, humorous incidents of past days and the possibility of wonderful development yet to come, of the application of electric power to surgery, air craft, systems of protection, and numerous other fields. The insight thus gained into the developments of the earlier days of the industry and the vista of the future, were received with much enthusiasm by the three hundred members present and gave a new perspective to their present connection with so progressive an industry. The course of electric wiring from the first installation of bare copper wire, unsupported, to the present systems, the reduction of the fire hazards or risks to the present minimum, with a suggestion of the new system of concentric wiring which is being widely discussed at the present time, were touched upon.

Mr. Devereux's humanly technical address made strong appeal to his entire audience and the talk was highly instructive and enjoyable.

At the close of Mr. Devereux's address a prize contest was held between the two vocal quartettes of the Company's Glee Club and a gold prize, offered by the Section, was awarded to the winner by the president of the Section, F. M. Weller.

Throughout the evening very delightful music was rendered by the company's Mandolin and Guitar Club. Other features included a selected reading and two reels of comical motion pictures.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS.

Three-Day Session at Minneapolis, Minn., January 26, 27 and 28.

The opening session of the tenth annual meeting of the Western Association of Electrical Inspectors, which was held at the Hotel Radisson, Minneapolis, Minn., was called to order 10:30 a. m. Tuesday, January 26, by President Ben W. Clark. The Hon. Wallace G. Nye, mayor of Minneapolis, welcomed the delegates and guests to the city of Minneapolis in a witty address wherein he pointed out the growing appreciation upon the part of men in every walk of life of organization and its effects in developing new ideas and in co-ordinating policies which were working for mutual benefits.

The Value of Electrical Inspection in Preventing Disasters.

In the absence of Waldemar Michaelson, the response was made by Victor H. Tousley, chief of the Electrical Inspection Bureau of the city of Chicago. Mr. Tousley rose to the occasion in fine fashion and said, incidentally, that it was not often that the inspector had an opportunity to talk to the mayor of a city. While he did have this opportunity he was going to take advantage of it and suggest to the mayor that sometimes the mayor's office, in the rush of things, was not intimately acquainted with the functions of the inspection department and the value and variety of the services it performs. The work of the electrical inspection department is most important; although it might seem an exaggeration, to Mr. Tousley's way of thinking, the preventive measures instituted by the inspection department were as necessary and important in their results as those of the sanitary departments, the health inspection departments and the medical supervisory organizations having to do with the health of the community. One of the difficulties of realizing the value of the inspection department is because the work does not show. It is only when something of a disastrous character happens that the inspection department is brought to the front and if the inspector has been negligent, the department is held responsible. In inspecting club houses, hotels, churches, theaters and other places where large crowds of people gather from time to time, it is highly important that inspection work be well done and the public and the mayor does not know, as a general thing, that very often the detection of a fire hazard has saved thousands of lives. And it is only through attendance at meetings such as these, where there is a general interchange of experiences, can the men directing the work of the inspection departments maintain a high standard of efficiency. Consequently it was highly desirable that the inspectors be encouraged to take an interest in such meetings, and the mayor's office could help materially by adopting a liberal policy of recognition, and make it a matter of public necessity.

The annual address of President Clark covered a brief resume of the activities of the year and a plea for more efficient work upon the part of the standing committees. The fact that the membership of the association covered all of the United States and Canada and considerable territory beyond indicates the importance of the association's work and it should be accorded the hearty support of all those interested in the development of inspection practices.

Vote of Thanks for Secretary Boyd.

The reports of the executive committee and secretary and treasurer were made by Secretary W. S. Boyd. There were 10 new membrs added to the list during the year and the total membership now stands at 170.

Discussing briefly the work that had been accomplished by the association during the past ten years, Secretary Boyd called attention to the fact that in promulgating safe rules for theater wiring, improved methods of crane wiring, developing modern systems for overhead wiring, for participation in making effective and reasonable rules for the grounding of secondaries, for improving electric sign wiring and for introducing the ordinances relating to conduit construction, the use of cabinets to inclose cutouts and notably for the removing of old-Code wire from circuits, the association had cause to congratulate itself and take great credit.

The morning session closed with a rising vote of thanks to Secretary Boyd for his efficient work in holding the organization together and stirring the members to participate in the development of the organization.

A very pleasant feature of the preliminary proceedings was a luncheon given by the Minneapolis Jovian League, to the delegates and guests. W. T. White, tribune, acted as toastmaster, and introduced several speakers, who made brief addresses of felicitation. Considerable amusement was caused by the presentation by Secretary Boyd of miniature housekeeping utensils to the visiting ladies, commemorating the tenth anniversary of the association.

Induction Motors and Rules for Wiring and Fusing.

The Tuesday afternoon session was opened with the reading of report of Committee on Induction Motors by K. W. Adkins, Chairman. This report is abstracted briefly as follows:

Since our last meeting your Committee on Installation and Operation of Induction Motors has made little progress and I regret to state that we have not followed instructions as given by members when it was voted that the report as presented at the ninth annual meeting be referred back to our committee for further consideration with instructions to modify, if possible, the wire sizes as given in the tables presented at that meeting.

In taking the question of tables and minimum wire size for induction motors up with several manufacturers with the object of obtaining data that would assist in our work of formulating suitable wire size tables, I quote the following from data submitted by F. A. Barron of the General Electric Company:

"On the question of the proper capacity of wire and fuses for the starting duty of induction motors, I take pleasure in stating that from a number of tests arranged to show the worst starting conditions induction motors are exposed to, we have arrived at the following conclusion:

"0 to 25 horsepower, two and one-half times rated full-load current of the motor.

"0 to 25 horsepower, two times rated full-load current of the motor.

"66 horsepower and upward, one and one-half times rated full-load current of the motor.

"Motors of five horsepower and over were started with compensators, the motor being connected to the highest tap of the compensator, which gives a voltage at the motor terminals of from 80 to 85 per cent of the initial line voltage.

"This will apply to the squirrel-cage type of induction motors and single-phase, repulsion-type motors, the latter having similar starting characteristics to the squirrel-cage type of motor. We believe the other types of alternating-current motors, such as the slip-ring and similar type, are sufficiently covered by Rule 8 of the National Electrical Code. These types of motors are usually started with a regulating resistance, which is ordinarly designed to keep the starting current down to somewhere near 25 per cent above the full overload rating of the motor. If they have any current peaks higher than 25 per cent, they are so brief that they do not ordinarily need to be considered. Moreover the regulation is in the secondary side of the motor.

"It may be of interest to you to know the method employed to determine the values for fuses and wire capacity for these motors. The motors were belted to a generator with a water-box load. As soon as the motor and generator were started the field resistance of the generator was entirely cut out, this allowing the generator to start up on full field, which imposed on the motor a very high starting current which was held until the motor reached maximum speed, when the current would drop to normal full load. This period of excessive acceleration varied from 15 to 30 seconds.

"After a rest of 30 seconds the motor was again started on the conditions described above. This starting operation was repeated 25 times in succession.

The fuses that held under these severe conditions were considered as a safe standard for this service. The fuse capacity ran about as follows for motors of 440 volts at 60 cycles:

5	horsepower,	20 amperes.
7½	horsepower,	25 amperes.
15	horsepower,	40 amperes.
35	horsepower,	80 amperes.
75	horsepower,	130 amperes.
150	horsepower,	250 amperes.

"The overload values given for starting the five horsepower would be adequate for motors of smaller horsepower. The reason why the value of the fuse and wire capacity of the larger motors can be only 50 per cent above their rating is because the larger fuses have a greater heat-storage capacity, which enables them to stand severe overload for periods up to 30 seconds without blowing.

"We may also add that the character of the tests imposed on these motors was the equivalent to blocking the rotor. We wish also to point out that the value of the starting current is practically independent of the load and depends on the voltage applied to the motor on starting.

"The power-factor of the system does not affect the starting current, this being entirely dependent upon the voltage at the motor terminal. The motor and starting fuses are affected only by the time taken to reach full speed and if this is prolonged beyond, say, 30 seconds, which is a very liberal time to allow the motor to start up, the fuses will blow."

I have stated in the above all of the principal data submitted by Mr. Barron to our committee and I would like to have members check up these values, as to fuse and wire sizes, by applying same to motor installations in their territory and let us know the results.

In reference to main and feeder size when supplying several motors, I am advised by two members of this committee that in Chicago mains are figured as follows:

The size of mains is the safe carrying capacity corresponding to the sum of the full-load current of all the motors, plus 50 per cent of the full-load current of the largest. The size of the wires for each motor is based on full-load current plus 50 per cent.

Starting devices are not required for motors of five-horsepower capacity or smaller unless the fusing must be greater than 225 per cent of full-load current. A motor may be fused for not more than 225 per cent of full-load current.

For small motors on lighting circuits, motors of one-sixth horsepower or smaller are permitted on such circuits allowing 200 per cent of full-load current.

In order to obtain uniformity in installation of induction motors, I believe it advisable to conclude this report with a few requirements, i. e.:

That all motors over five horsepower should be provided with approved starting devices.

Motors without compensation must be started by approved double-throw switch, which switch must be provided with spring release on starting side so it will remain in the starting position only when held there.

That each alternating-current motor of one-fourth horsepower or over be provided with separate fuse protection.

That proper rated running fuses be required for all motors of one horsepower and over.

When autostarters, of the type which use two single-coil transformers on two and three-phase circuits are used the middle fuse on the three-phase system on the "running side" may be omitted and when this type of starter is used on a two-phase, four-wire system, one fuse in each phase on the "running side" may be omitted.

That series relays should not be accepted in lieu of running fuses for motor protection.

That approved autostarters be accepted in lieu of switches as required by the rules, provided switches of autostarter disconnected all wires to motor.

Induction motors of the repulsion and slip-ring type should not be installed where subject to inflammable gases or flyings of combustible materials unless inclosed in cabinets or have dust-tight casings properly inclosing commutator or slip rings of motor, as approved by the inspection department having jurisdiction.

The discussion was participated in to some extent by F. A. Barron, of the General Electric Company, who had contributed much of the information upon which the test recommendations were based. Mr. Barron subsequently asked that a full discussion of the report be postponed until he could present some suggestions, based upon recommendations which the Sub-Committee on Induction Motors would make to the Electrical Committee of the National Fire Protection Association, and which would, in a way, eliminate many of the uncertainties connected with the present discussion. He suggested that the Code would probably be amended to take care of starting fuses and throw-over switches for starting small motors with high starting characteristics. He pointed out especially the condition that, with larger motors the higher time lag with the larger sizes of fuses gave greater margins of safety in the fusing of the mains and feeders.

There was a considerable discussion, led by Victor H. Tousley, regarding the extent to which the load-factor should be considered in figuring the size of mains and the size of fuses, both in the starting and running circuits. Mr. Tousley was of the opinion that the load-factor should be considered, and that the user of electrical energy should not be imposed upon to use a large amount of copper unnecessarily; that there were many installations, the maximum demand of which never came anywhere near the total connected load, and that, if the fuses and mains were figured for the total connected load, evidently an unnecessary burden was being carried. On the other hand, many inspectors were of the opinion that extreme conditions should be considered in every case, and that, in figuring the mains and fuses, the sum of the combined load of all the motors running, plus the starting current of the largest motor, should be taken into consideration when figuring the apparatus necessary for proper protection. The point, however, was made by several that in over-fusing to take care of the starting current, and not having sufficient wire capacity behind it, this left the way open for a similar condition to obtain under other circumstances.

Elevator Motor Control.

The discussion of this report was finally postponed, and J. H. Miller, general superintendent of the Otis Elevator Company, of New York, was called upon. Mr. Miller in turn introduced George H. Malcolm, of the engineering department of the Otis Elevator Company, who presented an elaborate discussion of the various characteristics obtaining with elevator motor control. Mr. Malcolm divided his subjects into alternating-current control systems and direct-current control systems, subdividing them again into those systems operating on high duty and those operating on low duty. He pointed out the phenomena which were produced in the various steps of controlling the elevator systems, and indicated that for low-speed alternating-current work, that low slip, low starting and low heating were sacrificed to simplicity of control. Above 15 horsepower, in addition to the simple elements of control, there is introduced a four or five-speed accelerating switch, usually of dashpot control type, either in elevator lever or on the machine. For high-speed operation, what would be practically a two-speed machine is employed. This is done by changing the relative number of poles in service, and changing over to the ratio of 3 to 1 or 4 to 1, which effects an easy reduction and facilitates good floor landings. There was some objection to the noise involved, but this can not be eliminated at present.

With direct-current motors of the low-duty type, drum machines are employed, using compound motors with series fields. The latter are cut out to accelerate the motor as a shunt motor. Laterally, departure has been made from the absolute compounding, owing to the impracticability of absolutely short-circuiting the series field. The series field bucks the shunt field, and causes bad speed characteristics. As an additional means of regulation, the armature is paralleled with a low resistance, the coil being practically short-circuited on the armature. For high-duty machines a different system of control is being adopted. This is where a speed of from 500 to 700 feet per minute is required. The elevator cables pass over the sheaves to counter weights, and the drive is obtained by the friction of the cable passing over the sheave; that is, the motor drives entirely by traction.

After the reading of this paper, the question was raised as to Mr. Malcolm's opinion on the need of some proposed changes in the National Electrical Code regarding elevator control. Mr. Malcolm, in reply, stated it was his opinion that the operation of elevator controllers and motors is so different from other motor operations that it should be considered separately. The circuits are so involved and of such a different nature, that they should be considered in another class. Elevator control and motor wiring cannot be likened to ordinary switchboard wiring. Making reference to the use of flameproof wire on the back of the switchboard, it was his opinion that it would be a commercial means of carrying out some of the requirements. A serious matter was the creepage current, or surface-conducting of flameproof material, which caused some of the magnets to hold when they should absolutely let go under release. He thought a good deal was being demanded that was not necessary, because the record showed that there had not been any burnouts, due to anything except exceptional causes, and these contributing causes had been removed by redesigning and relocation of certain of the choke coils and rheostats.

With regard to the use of special fittings for terminating the ends of the conduit, he said this was an especial hardship upon the elevator manufacturer, as these fittings were not available with more than eight outlets, and in many cases the elevator cables required a fitting with upwards of 25 outlets.

Signal Systems.

The report of the Committee on Signal Systems was presented by J. R. Morrissey, chairman. This committee recommended the grounding of fire-alarm boxes, both inner and outer shells, and further recommended that a standard of construction covering this feature be adopted by the Association. After considerable discussion, a motion was carried that the Association go on record as accepting the committee's report and recommending that both fire-alarm and police-alarm boxes be grounded and that the pipe leading from the box be insulated from the box.

Following the report of this committee, Frank F. Storer, representing the Star Electric Company, presented a paper describing the firm-alarm system manufactured by his company.

The nominating committee was announced as Emil Anderson, L. A. Bailey and F. D. Varnam.

More Discussion on Fusing of Feeders for Induction Motors.

The Wednesday morning session opened with a continuation of the discussion of the report of the Committee on Induction Motors. F. A. Barron, of the General Electric Company, described the conclusions arrived at by the Sub-Committee on Induction Motors for recommendations to the Electrical Committee of the National Fire Protection Association at the meeting in March next. The Sub-Committee feels that the time has arrived when some measure of assistance should be given to the inspection department and inserted in the National Electrical Code. It was therefore recommended that Rule 8, Section "C," of the National Electrical Code be amended to read: "That when rubber-covered wire carries the current of only one alternating-current motor of the type requiring large starting current, it may be protected by fuses or an automatic circuit-breaker without time-limiting device, in accordance with Table "B," Rule 18. The rated continuous current capacity of a time-limit circuit-breaker protecting motors of the above type need not be greater than 125 per cent of the motor's current rating; provided the time-limiting device is capable of preventing the circuit-breaker opening during the starting of the motor."

In addition to the above amendment there will be added to the Code a fine-print note, as follows: "In the great majority of cases where alternating-current motors of the above type are started by means of autostarters or compensators, the current capacity of wires meeting the rule will not exceed the following percentages of the full-load current of the motors: 0-30 amperes, 250 per cent; 31-100 amperes, 200 per cent; 100 amperes and above, 150 per cent."

Rule 23, Section "E." will also be amended to include the first paragraph of the amendment to Rule 8, Section "C," quoted above.

The classification of speeds for varying-speed motors as given in Rule 8, Section "B," fourth paragraph, will be revised as follows: "Operating valves, raising or lowering rolls, 200 per cent; rolling tables, 180 per cent; hoists, rolls, ore and coal-handling machinery, 150 per cent; shop cranes, tool heads, pumps, etc., 125 per cent.

On motion, the report of the committee, with Mr. Barron's further recommendations, were accepted.

Modern Flour-Mill Practice.

An article entitled "Electric Steam and Water Power in Modern Flour-Mill Practice" was presented by Charles A. Lang, superintendent of the Northwestern Consolidated Milling Company, Minneapolis, Minn. Mr. Lang traced the development of flouring mills from the old-fashioned, inefficient water wheels, with engine auxiliaries, to the present development utilizing water turbines and high-speed motors. He was in favor of the induction motor drive as against the use of synchronous motors, because of mechanical and electrical advantages. The induction motor, he said, could start practically any load, taking two and one-half times full load, if necessary. He pointed out that the speed of operation of the various features of flouring mills called for very uniform requirements over a very narrow range of speeds.

Electrolysis—Its Detection and Mitigation.

Burton McCollum, electrical engineer, Bureau of Standards, Washington, D. C., presented a paper entitled "Electrolysis, Its Detection and Mitigation."

Mr. McCollum pointed out that as the result of better bonding and the use of negative-return feeders, excellent conditions had been produced in Great Britain and Europe. In the United States insulated joints were being made considerable use of by both water and gas companies. Discussing the extent to which electrolysis takes place, he said that in some iron pipes the loss was as high as 25 pounds per annum per ampere, and in the lead sheath of cables, as high as 75 pounds per annum per ampere. These figures were exceptional, but where the soil was of ordinary moisture content, a general average might be struck at from 10 pounds to 25 pounds per annum per ampere. Attention should be directed to the fact that local conditions sometimes brought about corrosion for which electrical railways are held responsible. Only by careful analysis and tests could real conditions be discovered, and it must be determined not only if the underground piping system is at a difference of potential with the railway return, but it must also be determined if the underground structures are at any difference of potential with respect to each other. Calling attention to the corrosion of iron in concrete buildings, he emphasized the importance of keeping the reinforcing material free from grounds. It has been demonstrated that where there is a precipitation of iron-oxide in the concrete that the volume is increased two and one-half times over that of the original iron content. This brings about a pressure sometimes of many thousand pounds to the square inch. It is only, however, when the voltage impressed is very high that a hazard of fracture is involved. These high voltages are not ordinarily encountered. Electric light wires should never be grounded on the reinforcing materials in concrete buildings, and electrical conduit should never be grounded on the reinforcing material. Mr. McCollum also pointed out the effect of the

cathode phenomena which occurred when the current passed from the concrete to the reinforcing material. In this case, there was no precipitation of iron oxide, but a softening of the concrete immediately surrounding the iron caused a defect in bonding and if carried on continuously over a sufficiently long period, would result in a deterioration of the structure. With respect to the mitigation of electrolysis, a great many expedients had been tried out and all could probably be grouped under two general headings. These include principally the use of insulated joints and pipe drainage on the one hand, and the use of heavy negative railway returns, double trolley systems, three-wire trolley systems and alternating-current railway systems. Insulating joints properly installed and of sufficient frequency, may be made effective. Pipe drainage, that is, cable ties between railway return and the underground pipe structure, was efficacious, but was liable to lead to rapid corrosion of the piping system where high-resistance joints were encountered. Again, unless the entire adjacent underground piping system were taken into consideration and made a network, there would be established differences of potential between adjacent piping systems and the damage would probably be as great as before. There was also a possibility of heavy currents being introduced into the piping system and this might cause arcing at points where the continuity of the system was broken for any reason, and an additional fire hazard might be promoted where cables entered buildings. The most efficacious system and one which would throw the least burden of expense upon both the railway companies and the owners of underground piping systems, was the use of fairly heavy cable returns from the track systems; a high character of bonding, with the cable returns established at various sections of the track, keeping the potential drop low and the system well balanced. He also pointed out the desirability of regulation by Government authority, which would have the benefit of engineering and legal experience of all parties to the controversy, so that through joint action unfair burdens might be eliminated and no unjust and unwise legislation imposed upon the railway systems.

In answer to a question with regard to his opinion as to the possible hazard of grounding the bare sheath of a concentric wiring system employing direct currents, Mr. McCollum said that he would unhesitatingly decide against such an expedient.

Other Committee Reports.

The Thursday morning session was devoted to the presentation of the reports of the Committee on Underground Systems, Guy W. See, chairman; the Committee on Electric Traction Systems, Frank R. Daniel, chairman, and the Sub-Committee on the Wiring of Car Houses, J. B. Mahan, chairman. These committee reports were accepted and the committees continued. The Committee on Electric Traction Systems was especially requested to give further consideration to the matter of establishing some simple method of figuring the size of leads for car wiring of motors and resistances.

An address by John S. Taylor, entitled "How to Deal with the Public," gave many interesting insights on the art of human approach and the elements of mentality, physical health and attitude of the salesman in bringing to a successful issue his solicitation of business.

Rubber-Covered Wire.

The Committee on Rubber-Covered Wire presented its report on Thursday afternoon through its chairman, Victor H. Tousley. The report calls attention to the decrease in the use of sub-standard wire and the extensive use of new Code or standard wire. There is still a great deal of sub-standard wire being used for cords and for fixtures. The committee recommends that some distinctive marking be secured so that standard wire might be readily distinguished from sub-standard wire. It was developed that practically all of the manufacturers of rubber-covered wire in the United States and Canada were in favor of discontinuing the manufacture of sub-standard wire. Only a few manufacturers carry sub-standard wire in stock, and some make up sub-standard wire on order.

Elaborating upon the report, Mr. Tousley made a number of interesting comments upon the performance of rubber-covered wire in service, and cited an instance that had recently come to his attention. It appears that repairs are being made to the Holy Name Cathedral in Chicago, and it was discovered that the Okonite wire installed in the year 1893 and in use since then until January 18, 1915, was in every way as good as new. The testing inspector reports, "these tests show that this wire, which has been in service for about 22 years, successfully withstands the present tests which are applied to wire 30 days after its date of manufacture. The insulation is live; it allows bending and kinking without cracking, and it has good stretch and tensile strength. The voltage breakdown on a one-foot sample after immersion in water for 72 hours is 15,000 volts. The braid and its saturation are in good condition. Alterations are now in progress in the building from which this sample was removed, and on account of its excellent condition the owners have been notified that such wire need not be replaced with new wire."

The recommendation of the committee was adopted and a resolution passed, requesting a distinctive marking for standard wire.

Uniformity in Inspection Fees Recommended.

The report of the Committee on Laws and Ordinances, presented by W. S. Boyd, chairman, was adopted. This report shows a wide divergence of charges in various municipalities for inspection service, and the report recommended that the matter be given further study so that uniformity in inspection fees might be secured.

Approved Fittings and the Label Service.

An exceptionally interesting address, entitled, "Approved Fittings and the Label Service," was presented by J. E. Latta, special agent of the Underwriters' Laboratories, Chicago, Ill. Mr. Latta holds it as axiomatic that no commodity or medium of energy can come into great popular use unless the element of hazard to life and property is eliminated. The rules and recommendations for the safeguarding of electrical equipment and construction are the result of the wisdom and experience of the men who have had most to do with the inventions and the manufacturers that have had the greatest part in the development of the electrical industry. These safeguards have established a popular confidence that should not be dissipated. It was therefore important that no radical change from the Code be made. It was important that the standards be maintained and raised. It was also important that duplication of effort be avoided, and that where local inspection bureaus established their own laboratories and made rules to take care of special requirements that these be framed so as not to detract from or interfere with well established practice as laid down in the National Electrical Code. The label service of the laboratories was a follow-up and assisted in the maintenance of a safe product after its first inspection and approval. From a very small beginning, label service is now established in over ten thousand factories and over fifty million labels were used last year.

The Society of Electrical Development and the Electrical Inspector.

George B. Muldaur, in charge of the field development work of the Society for Electrical Development, presented an address dealing with the relation of the Society to the electrical inspector. Mr. Muldaur described the plan of the Society's work, and demonstrated its particular efficiency in co-

operating with municipalities and inspection departments in securing uniform ordinances and in bringing about a better realization upon the part of fire departments of the injustice to the electrical industry of attributing to an electrical origin fires the cause of which are unknown. The Society has received assurances from the chiefs of many fire departments that rules would be issued that no reference be made to a fire having been caused by crossed wires or other electrical disturbance unless the fact was definitely established.

Revision of National Electrical Code.

The report of the National Electrical Code Committee was presented by F. D. Varnam, chairman. This report was read by sections and the following paragraphs recommended for adoption:

Rule 68-d. 2nd paragraph: subject, Fuses. In the next to the last line, omit the words "and make it difficult for it to be replaced when melted."

This matter was referred to the committee by the Association at its last meeting held at Cincinnati. It appears to your committee that any further recommendations on the part of this Association would be unwise at this time as we are now on record with the National Electrical Committee on the subject of refillable fuses and we are informed that the Switch and Cut-out Committee is instructed to review the situation, obtain field experience and report at the meeting to be held in New York next March. We feel that our best efforts should be applied to supplying the Switch and Cut-out Committee with as much valuable information on the subject based upon actual conditions of field service as may be obtained from our members. We therefore recommend that no other action be taken at this time.

Rule 26-p. Insert the word "branch" before the word "circuit."

Rule 23-d. Fourth paragraph. Omit the words "If the fuses are omitted in the neutral or if the difference of potential between the two outside wires is over 250 volts.

Rule 26-s. Add new sentence at the end of the first paragraph to read "The length of wire placed in flexible tubing must contain no joints or taps."

The Committee on Revision of the Constitution and By-Laws presented its report and a recommendation that this report be issued to the entire membership for a letter ballot, was adopted.

Upon recommendation by H. E. Bloomer, a committee will be appointed to draft rules for the installation of elevator motors and equipment.

Immediately following the close of the formal discussion on Thursday afternoon, the Nominating Committee made its report and the following officers were elected for the ensuing year:

President, H. M. Maxwell, Dayton, Ohio.

First vice-president, F. H. Moore, Indianapolis, Ind.

Second vice-president, Emil Anderson, Minneapolis, Minn.

Secretary-treasurer, William S. Boyd, Chicago, Ill.

Executive Committee: J. R. Morrisey, chairman, Joliet, Ill.; V. H. Tousley, Chicago, Ill.; Charles L. Reasoner, Colorado Springs, Colo.; R. W. Adkins, St. Louis, Mo.; F. H. Moore, Indianapolis, Ind.; H. M. Maxwell, Dayton, O.; Emil Anderson, Minneapolis, Minn.; R. J. Swain, St. Boniface, Canada; George Cotton and William S. Boyd.

Entertainment.

A very interesting feature of this year's convention was the attendance of a number of ladies. Special entertainment was provided, and the visit was greatly enjoyed. Tuesday morning was devoted to registration and a reception in the ladies' parlor, and on Tuesday afternoon Walker's Art Gallery and the Public Library were visited. On Tuesday evening there was a reception to the delegates and ladies, followed by a Jovian ball and card party. On Wednesday afternoon there was a sight-seeing tour for the delegates and ladies by automobile, when the new Art Institute was visited. On Wednesday evening a formal banquet was given, followed by moving picture and stereopticon illustrations of a trip through Yellowstone Park. On Thursday afternoon there was tea and dancing at the Hotel Radisson, and on Thursday evening a theater party.

The formal exercises of the convention were closed on Thursday evening with a joint dinner of the Western Association of Electrical Inspectors and the American Institute of Electrical Engineers. This was followed by the regular monthly meeting of the Minnesota Section of the American Institute of Electrical Engineers when Charles L. Pillsbury, consulting engineer, Minneapolis, presented a comprehensive address on the principles entering into valuation of public utilities. After the address a complimentary smoker was tendered to the delegates.

Exhibits of the Manufacturers.

Several manufacturers of standard wiring devices made exhibits in the hallways and rooms adjoining the convention hall. Among these were the Appleton Electric Company, Chicago; the Ohio Distributing Company, Chicago; the Economy Fuse & Manufacturing Company, Chicago; Jacob Andresen Company, Minneapolis; Harry Winder, Chicago; Chicago Fuse Manufacturing Company, Chicago; National Metal Molding Company, Chicago; Superior Electric Manufacturing Company, Minneapolis; Trumbull Electric Manufacturing Company, Plainville, Conn.; Electric Machinery Company, Minneapolis; Steel City Electric Company, Pittsburgh; Minneapolis Electric & Construction Company, Minneapolis, and W. T. White, Minneapolis, in charge of the exhibits of the Cutter Electric Manufacturing Company, Philadelphia, Pa., and the Sangamo Electric Company, Springfield, Ill.

Inauguration of the Engineering Foundation.

Exercises were held in the Engineering Societies Building, New York City, on the evening of January 27, in connection with the inauguration of the Engineering Foundation, based upon a donation of $200,000 by Ambrose Swasey for "the advancement of the engineering arts and sciences in all their branches to the greatest good of the engineering profession and for the benefit of mankind."

Addresses were made by Gano Dunn, president of the United Engineering Society; Henry S. Pritchett, president of the Foundation for the Advancement of Teaching; Robert W. Hunt; Alexander C. Humphreys, past-president of the American Society of Mechanical Engineers.

Mr. Swasey is a member of the firm of Warner & Swasey, well known as builders of machine tools and telescope mountings, Cleveland, O. He is a past-president of the American Society of Mechanical Engineers.

Kansas City Electric Club Entertains.

The co-operation of the Electric Club of Kansas City, Mo., with the Commercial Club was expressly sought by J. H. Forsee, of the latter organization, in an address before the electrical men January 26. He invited the members to join the Commercial Club. All business and civic organizations should unite in co-operative civic enterprise, said the speaker. A. A. Guardia, of Chicago, Statesman-at-Large for the Jovian Order, and Dr. R. W. Holbrook, Kansas City, also addressed the meeting.

Several visiting electrical men were present. They were: L. M. Nichols, Western Electric Company, New York; R. W. Rauschkolb, Wagner Electric Company, St. Louis; F. J. Kysela, National Carbon Company, Cleveland; R. W. Hawkins, V. V. Fittings Company, Philadelphia; and L. A. Northschield, General Electric Company, St. Louis, Mo.

Program of Midwinter Convention of American Institute.

The third New York midwinter convention of the American Institute of Electrical Engineers will be held at Engineering Societies Building, 29 West Thirty-ninth Street, New York, on Wednesday, Thursday and Friday, February 17, 18 and 19, 1915.

The program will be of a general nature. Two sessions will be under the auspices of the Transmission Committee; one of these will be devoted to the discussion of impact testing of high-tension insulators; the other to miscellaneous subjects connected with high-tension work. Another session will be devoted to papers provided by the Electrophysics, Electric Lighting and Mining Committees. The session on Friday morning will be devoted exclusively to the subject of electrical precipitation of fumes, smoke, dust, etc., and several papers will be presented dealing with the historical, theoretical and practical aspects of this subject. It is expected that a demonstration of electrical precipitation will be given, and two reels of motion pictures showing the operation of some Western installations will be shown. The last technical session of the convention will be devoted to the subject of application of electric motors, and a number of prepared discussions will be presented giving the characteristics of each type of motor which govern its application to various kinds of work. The session on Wednesday evening will include addresses by a number of prominent engineers on the general subject of the status of the engineer.

On Thursday evening a Dinner-Dance will be held at the Hotel Astor. Thursday afternoon will be devoted to inspection trips to points of engineering interest.

The detailed program of papers is as follows:

Wednesday, 10:00 a. m.: "Electrical Porcelain," by E. E. F. Creighton.

2:30 p. m.: "Effect of Moisture in the Earth on Temperature of Underground Cables," by L. E. Imlay; "Oil Circuit-Breakers," by K. C. Randall; "Comparison of Calculated and Measured Corona Loss Curves," by F. W. Peek, Jr.; "A 100,000-Volt Portable Substation," by Charles I. Burkholder and Nicholas Stahl.

8:30 p. m.: "The Status of The Engineer" will be presented by Lewis B. Stillwell, E. W. Rice, Jr., E. M. Herr, Alexander C. Humphreys, John Hays Hammond, George F. Swain, H. G. Stott, and J. J. Carty.

Thursday, 10:00 a. m.: "Distortion of Alternating-Current Wave Form Caused by Cyclic Variation in Resistance," by Frederick Bedell and E. C. Mayer; "Dimmers for Tungsten Lamps," by Alfred E. Waller; "Searchlights," by C. S. McDowell.

Friday, 10:00 a. m.: "Electrical Precipitation," by F. C. Cottrell; "Electrical Precipitation—Theory of the Removal of Suspended Matter from Fluids," by W. W. Strong; "Practical Applications of Electrical Precipitation," by Linn Bradley; "Theoretical and Experimental Considerations of Electrical Precipitation," by A. F. Nesbit.

2:30 p. m.: "The Characteristics of Electric Motors Involved in their Operation," by D. B. Rushmore.

Electrical Opportunities Looking up in Colorado.

Correspondence from Denver, Colo., indicates that the outlook for the electrical industry in Colorado and adjacent states is bright. There appears to be a quickening of activity and a large number of inquiries for new material, and among the supply men an optimistic feeling prevails. The main reasons given for the improved feeling are as follows: The settlement of the coal strike, with the expectation that there will be little danger of interference from outside sources, has resulted in the starting up of the mines, carrying with it a demand for a considerable amount of supply material and new apparatus for rehabilitation and extensions. A number of new coal mines are being opened up and this has developed an increased demand for new material. The Cresson mine has opened up gold-bearing strata at a depth previously unheard of, and a number of gold mines which have not been operated for years are being opened up and will be in operation as soon as the owners decide on the necessary mining machinery.

Meeting of New York Contractors.

The New York State Electrical Contractors' Association held its annual meeting in Albany, N. Y., January 19, and elected the following officers: president, L. A. Wood, New York; secretary, George Russell, New York; treasurer, James Burns, Schenectady; members of the national board of directors: James Strong, James Hilton, and Rudolph Schmidt.

Chicago Electric Club.

Charles S. Cutting, former Probate Court judge in Chicago, was the speaker at the meeting of the Electric Club of Chicago, on Jannary 28. Judge Cutting commented on the reaction that invariably follows radical reforms in civic and political activity. He referred to the governmental control of private enterprises and to the extent of this form of activity in the State of Wisconsin which he believes has been carried to such an extent that a period of reaction has set in.

Judge Cutting advocated reforms in the judicial elections and urged that fitness for office be the only standard by which judicial candidates be measured.

Dayton Jovians Initiate Big Class.

The annual rejuvenation meeting of the Dayton, O., Jovian League, and the first full meeting of the year, took place Tuesday evening, January 26, at the Algonquin Hotel, with over 80 persons present, and 12 new members for initiation. Besides these, there were present a number of distinguished out-of-town guests, including the following: Past Jupiter W. N. Matthews, of St. Louis; Congressman A. E. Loeb, of Columbus; M. J. Wolf, of St. Louis, Statesman for Missouri; Patrick F. Lyons, of Chicago, and First Tribune Carl Metz, of Columbus. The Dayton degree team handled the ceremonies in faultless style. The team is composed of W. B. Unger, H. H. Wollaston, K. W. Nocka, Stanley Perry, George Gnau, H. E. Long, C. A. Kuebler, G. B. Sayre, O. B. Remelin, Hal McAllister, James Atwood and R. R. Pleasant. The new members initiated were: T. H. Barlow, Dayton Manufacturing Company; J. A. Keyes, Dayton Plating Company; Charles H. Getz, Dayton Engineering Laboratories Company; L. B. Williams, Dayton Recording and Computing Scales Company; A. L. Wetz; A. L. Hill, Hill Electrical Company; C. N. Zartman, manager of the Algonquin Hotel, and Algonquin Power and Light Company; A. J. Broachey, Cotton Electrical Company; S. H. Thomson, A. E. Jolly and R. A. Folsom, of the Ohio State Telephone Company.

An enthusiastic membership campaign is under way, which will be conducted until March 17, when a rejuvenation will be held to initiate the new members secured. A feature of the evening was the sending of a telegram tc Alexander Graham Bell, at Boston, as follows:

"Dayton Jovian League in session tonight wishes to congratulate you upon the accomplishment today of transcontinental vocal communication."

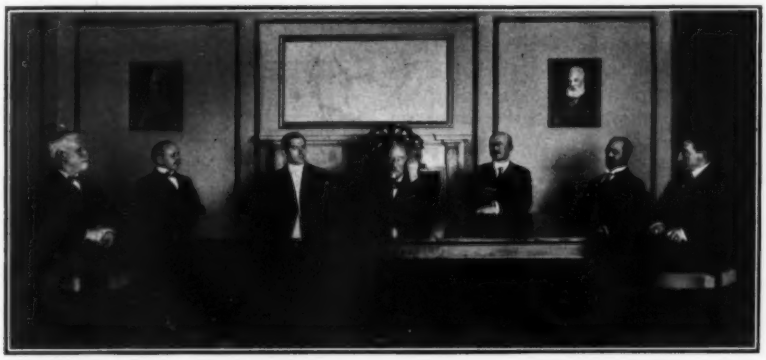
Erie Jovians Hold Rejuvenation.

The annual rejuvenation of the Jovian League, of Erie, Pa., was held on Monday evening, January 25, at the Reid House. There were about 100 members in attendance and the class of initiates included William J. Stern, mayor of Erie. Mayor Stern was the principal speaker of the evening, other speakers being L. S. Montgomery, Buffalo; T. E. Devine, Buffalo, and S. Y. Rossiter.

Telephoning Across the Continent.

In the last issue an account was given of the formal opening of the transcontinental telephone line of the American Telephone & Telegraph Company, on January 25, with the ceremonies taking place in New York City. On the evening of the same day conversations were carried on between Boston and San Francisco, and the accompanying illustration shows the group of men at the Boston end of the line. Henry L. Higginson, an early director of the American Telephone & Telegraph Company, talked with Thomas A. Watson, Professor Bell's early associate, at the Pacific end of the line, 3,505 miles distant.

Besides Major Higginson there were present Mayor Curley, of Boston, who exchanged greetings with Mayor Rolph, of San Francisco; President Bliss, of the Boston Chamber of Commerce, who talked with the President of the San Francisco Chamber; Chairman Macleod, of the Massachusetts Public Service Commission, who talked with Mr. Phelan, a member of the California Commission; Thomas D. Lockwood, patent attorney of the telephone company, who conversed with Thomas B. Doolittle, the inventor of hard-drawn copper wire; and President Spalding, of the New England Company, who greeted President McFarland, of the Pacific Telephone & Telegraph Company. All declared the transmission to be remarkably clear. The total length of line between Boston and San Francisco is 3,505 miles.



Boston Terminus of Transcontinental Telephone Line During Opening Ceremony.

While Major Higginson was talking with Mr. Watson, the former made reference to President Vail, expressing regret that he was not on the line. To the surprise of all, Mr. Vail's voice replied: "I'm here." He was speaking from Jekyl Island, Ga., where he is convalescing from an accident.

The Boston Elevated Railway Company has been awarded the Brady medal for having done the most during the year for the safety and comfort of passengers.

American Electric Railway Association.

Marked with an address by President Wilson, a feature that has been a rarity at public gatherings since the President took office, the sixth mid-year meeting of the American Electric Railway Association was held in Washington, D. C., January 29, closing with a banquet at night at which more than 500 were present.

The leading men in the electric railway industry gathered at the Capital for the occasion, many representative men from allied electric industries also being present, among them Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company; J. H. Pardee, president, The J. G. White Management Corportion; N. C. Kingsbury, vice-president, American Telephone and Teleghaph Company; Charles C. Pierce, of the General Electric Company; C. L. Henry, president of the Indianapolis & Cincinnati Traction Company; Colonel T. S. Williams, president of the Brooklyn Rapid Transit Company, and Hon. John W. Weeks, United States Senator from Massachusetts. All of these delivered addresses, as well as Representative Sherley of Kentucky, and former Governor, now Representative Montague of Virginia. Mr. C. Loomis Allen, president of the Association, presided.

Members of President Wilson's cabinet accompanied him to the meeting, which was held at the New Willard Hotel, and he seemed, in the opinion of those present, to be anxious to carefully explain to his auditors that "Business" is to be given "a square deal" during his administration. In his speech he declared that "henceforth nobody is going to be suspicious of any business just because it is big."

"I have always maintained," the President said, "that the only way in which men can understand each other is by meeting each other. If I believed all that I read in the newspapers, I would not understand anybody. I have met many men whose horns dropped away the moment I was permitted to examine their character.

"Enterprise has been checked in this country for almost twenty years because men have been moving amongst a maze of interrogation points. They did not know what was going to happen to them. All sorts of regulations were proposed and it was a matter of uncertainty what sort of regulation was to be adopted. All sorts of charges were made against business, as if business were at fault, when most men knew that the great majority of business men were honest, were public spirited, were intending the right thing, and the many were made afraid because the few did not do what was right."

The President then declared that the government has defined what shall and what shall not be done, alluding to the recent trust legislation and the creation of the Federal Trade Commission. "I feel," he said, "that the mists, the miasmic airs of suspicion, that have filled the business world have now blown away. Knowing the elements we have to deal with, we can deal with them, and with that confidence of knowledge we can have confidence of enterprise."

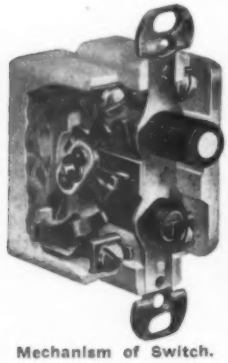
The president said that business owes a constant report to the public, whose money it is constantly asking for, on the ground that the era of private business has passed away. Almost all business in these days, he said, has a direct responsibility to the public in general. The President used the language of sportmanship to illustrate several points he made, declaring that there have been times, he would not specify them, when the field looked free to all business men but when favors were received from the managers of the course, inside tracks accorded, and other practices indulged in which would block the runner. Continuing along this line, he said he regarded the game of business as requiring something more than ordinary sportsmanship. "Business today," he said, "requires a certain kind of conscience, a certain feeling that we are, after all, in this world because we are expected to make good according to the standards of the people we deal and live with." The President added:

"I take it that we are in a position now to come to a common understanding, knowing that only a common understanding will be the basis of stable business and that what we want for business hereafter is the same kind of liberty that we want for the individual. We are sustained by the moral judgment of honorable men and there isn't anything else in this world that I know of that is more worth while."

New Electrical and Mechanical Appliances

New Trumbull Push-Button Wall Switch.

A new type of push-button switch has been placed on the market by the Trumbull Electric Manufacturing Company, Plainville, Conn. This type of switch is the achievement of some three years of painstaking development work, the aim of which was to produce a switch of exceptionally simple construction and extraordinary strength. The accompanying illustration shows the simplicity of the design of the mechanism, it having fewer parts than most switches of this type now on the market. This not only lessens friction and the liability for derangement but permits concentrating the strength into those parts where it is most needed. Prolonged tests of the severest character have shown that the switch could withstand an overload 50 per cent greater than any other switch of this type. The action is simple and easy. The appearance of the entire switch is neat and attractive. The manufacturer is prepared to send samples of these switches to contractors.



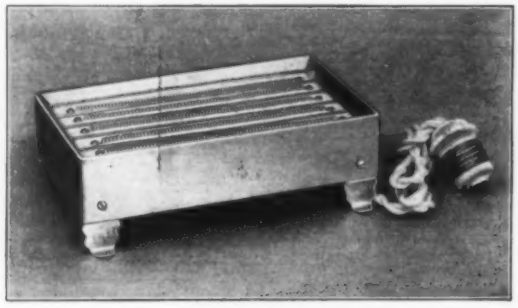
Mechanism of Switch.

Rapid and Economical Toaster.

A new electric toaster with many strong claims for superiority has been developed by a heating specialist as the result of several years of study of the requirements for this type of appliance. A large number of these toasters have been put into use in this and several foreign countries and their satisfactory performance has shown that the manufacturer's claims were deserving of careful attention. Probably the most striking feature of the device is the speed with which the toaster gets into action and performs its work. Only a few seconds after closing the circuit the coils are at red heat. Toasting is very quickly and uniformly done, the toast acquiring an even brown color without showing scorched wire streaks. The toaster is low in first cost and economical in operation.

The accompanying illustration shows the simplicity of construction that permits these features to be attained. The frame is made of cold-rolled sheet steel of simple outline. A special composition heat-resisting and insulating block, one-half inch thick, forms the body and supports the five helical coils of No. 26-gauge Nichrome wire that constitute the heating element. The toast-supporting grid holds the toast three-fourths inch over the heating coils so that the heat thereof passes into the bread by direct radiation, by convection air currents, and by reflection from the body. Thus very little heat is wasted and the 440 watts taken by the device is effectively utilized, which accounts for the high speed of toasting. The toaster has a working surface of 4 by 7 inches, which is ample for toasting two slices of bread at one time. Crumbs, being confined by the rim, do not fall upon the table yet can be readily removed by turning the toaster upside down when through using. The outfit is neatly finished in nickel, brushed brass or copper. Each toaster is equipped with an approved silk-covered connecting cord and two-part attachment plug. The entire construction is simple, light (the weight being only 31 ounces) and durable.

This outfit goes by the trade name "P. J. Lightning Toaster," and is manufactured by the P. J. Electric Heating Company, 332 South La Salle Street, Chicago, Ill.



P. J. Electric Toaster.

Menominee Table Fan.

To the line of electric fans made by the Menominee Electric Manufacturing Company, Menominee, Michigan, there has been added this year an eight-inch socket fan to meet the demand for a small fan for small offices and for residence use. The company has also added a new horizontal table fan, which is a development of the table fan formerly made by this concern. This new fan, however, embodies a number of striking features in which this manufacturer takes considerable pride. Since the table fan is designed primarily for use in dining rooms, it was thought desirable to enhance the attractiveness of the outfit. For this reason the fan was produced with white-enamel and nickel-plate finish to harmonize with the white and silver settings of the table. Occupying a conspicuous place in the center of the table, this new fan has been made ornamental as well as useful. The air distribution from the fan is particularly advantageous for this service, since it does not produce an unpleasant draft and because it distributes the air continually and evenly about the table. This fan may also be used for library tables, desks, etc.

Menominee Table Fan.

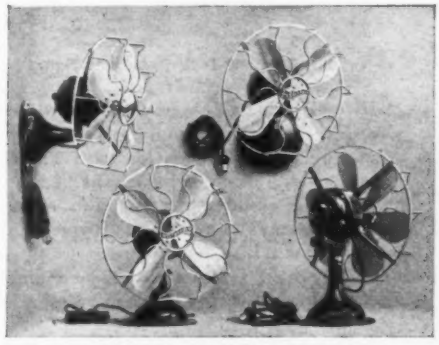
Westinghouse Electric Fans for 1915.

So satisfactory have been the previous years' design of fans that practically no change has been made in the Westinghouse line for the coming season. The only changes in the line are the substitution of new 56-inch and 58-inch direct-current ceiling fans for the 54-inch and 57-inch fans formerly supplied. The increasing use of fans in the home has made it advisable to include a separable attachment plug and eight feet of cord with each desk and bracket fan.

Style and finish in electric fans are being more and more appreciated and insisted upon by the public. The pleasing appearance of Westinghouse fans is due largely to the use of drawn metal for the frame and motor base. The smooth surface of the drawn-metal frame takes a more attractive finish than the rough surface of cast iron; at the same time the strength is increased and the weight reduced considerably.

Tests are said to have demonstrated that they use less current per cubic foot of air moved than any other fans on the market.

The motor has no hum and the unavoidable whir of a volume of air at high velocity is reduced to a minimum by proper design of blades and selection of speed. For particularly quiet running, required in bedrooms, theaters, private offices and similar places, the low-speed, six-blade fans have been found practically ideal, the sound being reduced to the faintest drone, though they move the same volume of air.



Non-Oscillating and Oscillating 12-Inch Desk and Bracket Fans.

A strong guard, the protecting felt base covering the entire bottom of the fan, the perfect oiling system, the adaptability for either desk or bracket mounting renders the drawn-metal-frame fans particularly desirable.

The Westinghouse line comprises the following types of fans:

Desk and bracket fans, swivel and hinge type—8-inch, 12-inch and 16-inch; four-blade and six-blade.

Desk and bracket fans, oscillating type—12-inch and 16-inch; four-blade and six-blade.

Exhaust fans—12-inch and 16-inch; four-blade and six-blade.

Ceiling fans—alternating-current, 32-inch and 56-inch; direct-current, 32-inch, 56-inch and 58-inch.

Column fans—56-inch.

All desk and bracket fans have three distinct speeds. The motor can be started and operated continuously on any of the speeds, and there is a very noticeable difference in the effect produced by the fans at the different speeds. The speed is controlled by a switch in the fan base. The switch lever has a notched metal guide, and is firmly held at each running point; it does not open the circuit between contacts, so that the power supply to the motor is continuous, and the circuit cannot be opened by pressure on the handle. The switch is mounted on the steel base plate; removing the base plate makes all parts accessible.

Westinghouse-Ventura Exhaust Fan.

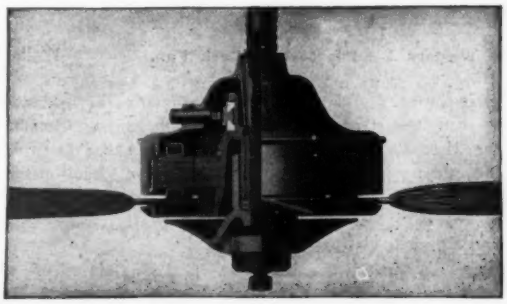
The fan rests on a felt pad, backed by a steel plate, similar to a desk telephone base, and cannot mar even the most highly polished surface. The felt is firmly clamped (not cemented) in place by a steel ring inside the base. The steel base plate also affords mechanical protection to the control switch in the base, an exclusive feature of Westinghouse fans.

By use of a wing-nut adjustment the 12-inch and 16-inch swivel and hinge fans can be tilted forward 15 degrees, backward 90 degrees, and rotated 340 degrees, a stop-pin preventing complete rotation, so that there is no danger of breaking the leads.

The oscillating fans make about eight complete oscillations per minute, over an arc of 45 or 90 degrees, as desired. The oscillating mechanism is geared to the armature shaft, and has such high efficiency that it requires only two additional watts and does not affect the speed of the fan. It consists of a lever driven by a crank disk, which is operated from the motor shaft through two gear reductions, a worm and a spur. The worm wheel drives through a ball clutch so that, if the fan guard strikes an obstruction during oscillation, the fan merely stops oscillating without interfering with the operation of the motor. This prevents the burning out of the motor, the stripping of the gears, or the overturning of the fan.

The oscillating movement can be stopped instantly by raising the knurled head on top of the mechanism, and can be started by pushing this head down. Either operation can be performed while the fan is operating. The oscillating mechanism is entirely inclosed, and will not drop oil. Both the motor shaft and the crank shaft are grooved spirally to insure proper lubrication, and at the same time to cause the return of the surplus lubricant by a pump action to the reservoir in the top of the mechanism, while provision is made to prevent the escape of lubricant over the frame. A special flexible cable is used to carry the current from the base to the motor.

For use particularly in telephone booths a special type of motor mounting has been devised which prevents vibration from being transmitted to the telephone when the fan is running. The motor is suspended from a bracket by four springs. The motor body can be removed from the bracket by loosening a wing-nut and pulling apart a connector between the motor and the base.



Partial Section of 56-Inch Westinghouse Direct-Current Ceiling Fan.

Westinghouse exhaust fans are driven by small motors which have proved the excellence of their design and construction by years of satisfactory service. They require little attention beyond lubrication about every four to six months. The motor and frame are finished in black enamel, the blades in dull black.

Westinghouse Sirocco blowers are

especialy adapted for use in connection with a system of piping or where there is some resistance to the passage of the air. They should be used where the exhausted air contains smoke, fumes, dust, etc., as the air does not pass through the motor windings. These fans are for moving larger volumes of air than is possible with the 12-inch and 16-inch exhaust fans, and where the air passages are also open and unobstructed.

Ball bearings are used in all the alternating-current motors. The ball race consists of hardened steel plates. The shafts of all motors are of hardened steel, and with proper care will give long service with inappreciable wear.

The new 56-inch direct-current ceiling fans have a combination fiber and tool-steel bearing immersed in oil, giving an unusually low current consumption. For lubricating the 56-inch and 32-inch alternating-current motors and the 56-inch direct-current motors, oil is poured in through a hole at the top

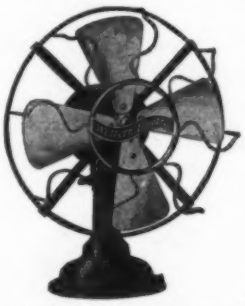
Western Electric 16-Inch Desk Fan.

of the motor and runs into a reservoir around the bearings. The bearings are, therefore, immersed in oil. When the motor is in operation the oil is pumped upward along the shaft by means of a spiral groove on the shaft and flows back into the reservoir.

Western Electric 1915 Fans.

The line of electric fans that the Western Electric Company has placed on the market for 1915 has been carefully selected to meet practically all fan-motor requirements. Their predominant features are those that have characterized this line of fans for the last few years, namely, the drawn-metal motor frame and base, which produces a strong and light-weight construction, the low cost of operation so desirable for economy, the high air-moving capacity, and the attractive finish.

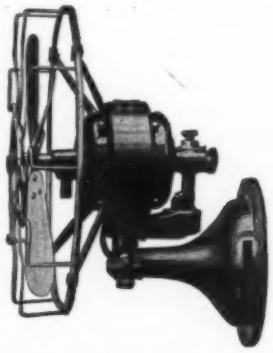
All of the desk and bracket fans, which are made in 8, 12 and 16-inch sizes, have three speeds on each of which they may be operated continuously. All direct-current fans, as well as all the 25 and 30-cycle fans and all the eight-inch fans for all frequencies, are series wound; the 12 and 16-inch fans for 40, 50 and 60 cycles



Eight-Inch Desk and Bracket Fan.

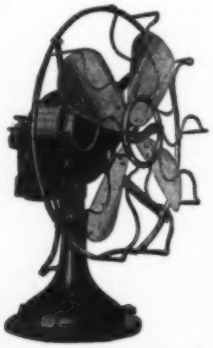
are induction motors with split-phase starting. Desk fans may be changed to the bracket mounting by means of a swivel and hinge joint that requires merely the loosening of a wing-nut to permit adjusting the angle.

Oscillating fans have the mechanism



Wall-Mounted 12-Inch Oscillator.

arranged to make about eight complete oscillations per minute through an arc of 45 or 90 degrees, as preferred. This oscillating mechanism is claimed to be



Same Oscillator Arranged as Desk Fan.

very efficient, as fans equipped with it take only about two watts more power than similar non-oscillating fans. If the guard or other part of the fan strikes an obstruction while oscillating, the oscillation merely stops without doing any damage. The oscillating movement can be instantly started and stopped by movement of a knurled head on top of the mechanism.

In the accompanying illustrations are shown a number of typical Western Electric fans of the 1915 line. One of these is a six-blade, 12-inch fan specially suitable for use in residences where a powerful, but very quiet running fan is desired. The cuts show that the oscillating fans may also be arranged for either desk or wall mounting, in fact, they are capable of adjusting through a considerable angle. Careful inclosing of the oscillating mechanism is also shown.

Aside from the standard 110 and 220-volt fans, direct-current fans are also made for 30-volt circuits and special 9 and 12-inch railway fans are made for 30 and 60 volts. A 12-inch fan with resistor is also made for operating on 500 or 600-volt electric railways. An eight-inch, six-volt battery fan is also available. Alternating-current fans are made for 110 and 220 volts and for 25, 40, 50, 60 and 133 cycles.

In the line of ceiling fans the Western

Six-Blade 12-Inch Residence Fan.

Electric Company is now listing 32-inch and 56-inch alternating-current fans for all the above frequencies, also 32-inch and 58-inch direct-current fans. A number of counter-column and floor-column fans are made, as also quite an assortment of exhaust fans.

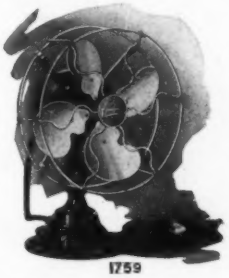
As already announced, the company has this year inaugurated a special dealer-help campaign, which it is believed will greatly stimulate the sale and use of Western Electric fans.

New Emerson Fans.

To the already extensive line of electric fans made by the Emerson Electric Manufacturing Company, 2024 Washington Avenue, St. Louis, Mo., there has been added this year a nine-inch oscillator which is of a size and type not heretofore offered by any manufacturer. Another development by this company is the placing in the regular stock list of fans the six-blade, 60-cycle ceiling fan, which although manufactured for several years has not

been regularly listed. This particular fan has three speeds, the maximum being about 325 revolutions per minute; the sweep of the blades is 32 inches. This type of fan, which has been installed in numerous southern hotels, has been found to require about 20 per cent less current than similar ceiling fans of wide sweep. Another new departure by this company is in supplying ten-foot cords for all desk and oscillating fans, instead of the six-foot cords formerly provided.

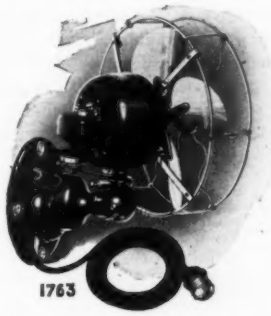
In bringing out the new nine-inch oscillator, the idea was to supply a fan of this type in small size but more powerful than the eight-inch oscillators placed on the market by many manufacturers. In order to secure sufficient volume of breeze by an eight-inch fan, it is necessary to operate at a very high speed, which produces objectionable noise and results in rapid depreciation of the moving parts. The nine-inch oscillator has an induction type motor which operates at a maximum speed of 1,550 revolutions per minute. The Emerson company is also making a similar type of oscillator for



New Nine-Inch Emerson Oscillator Set Up as a Desk Fan.

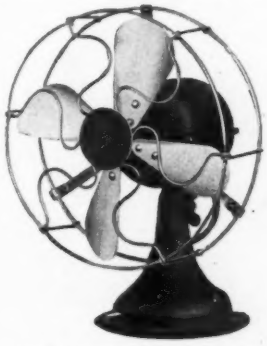
direct current which is, of course, of the series-wound, brush type. The blades on these fans are of slightly modified Parker design, which gives them an additional attractiveness and promotes noiseless operation. The fan weighs only 13 pounds net; thus it is readily portable for residence use. This light weight is obtained by using the drawn-steel construction. At full speed the fan takes only about 35 watts, this being a considerable saving in power consumption over even the eight-inch oscillators of the brush type commonly in use.

The oscillating mechanism for the new fan is of the same type as that which was used so successfully on the 12-inch and 16-inch Emerson fans last year. The ratchet case has provision for securing six different arcs of oscillation from 90 to 15 degrees, and also for securing non-oscillating position, all by adjustment of a single lever. An adjusting collar is provided, by means of which the range of oscillation can be confined to five different zones; this permits directing the breeze into a particular portion of the room. A safety device is provided to prevent accident to the mechanism in case the oscillation of the fan is obstructed by contact



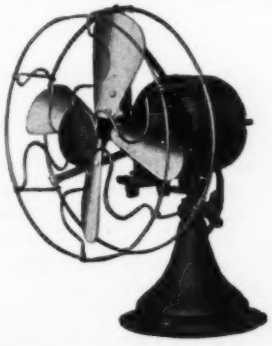
Emerson Nine-Inch Oscillator as a Wall Fan.

with some stationary object. Each part of the oscillating mechanism can be reached for renewal or inspection from the outside and with the use of merely a screwdriver. The fan may be tilted



Peerless Eight-Inch Drawn-Steel Desk and Bracket Fan.

up or depressed by loosening a wing screw; this also permits changing the fan from the upright to the wall mounting. These various adjustments per-



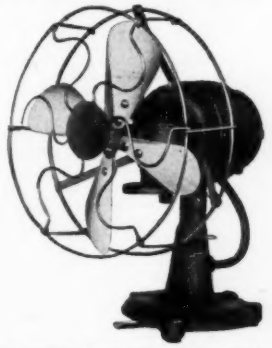
Peerless Eight-Inch Drawn-Steel Oscillator.

mit, among other things, mounting of the fan in a corner without wasting any breeze on the wall; the fans may be mounted on the side walls, as for example, in motion-picture theaters, and pointed so as to assist the general movement of the air in one direction toward the air outlets; in general use the fan may be placed in any desired position so that its breeze is effective not only in stirring up the air, but also in actively aiding ventilation by the bodily removal of stale or vitiated air.

Peerless Electric Fans.

The Peerless Electric Company, Warren, O., has added to its well known line of electric fans a number of eight-inch fans. This is in response to a demand for small and light-weight and therefore more readily portable fans, both of the non-oscillating and oscillating types. These new fans are made in both the desk and bracket and the oscillating types with drawn-steel frame and base. The alternating-current fan is of the induction type; the direct-current fan is of the brush and commutator, series-wound type.

The company has also added a commutator-type, series eight-inch desk fan both in the nonoscillating and oscillating types, which is made with cast-



Peerless Eight-Inch Oscillator with Cast-Iron Frame and Base.

iron frame and has a universal motor, that is, which can be operated on either direct current or alternating current.

All of these fans are made with attractive outline and high finish. The oscillating mechanism is of simple but reliable construction. All of the fans can be mounted in either upright or bracket position by merely loosening a wing-nut which permits adjustment through a wide angle.

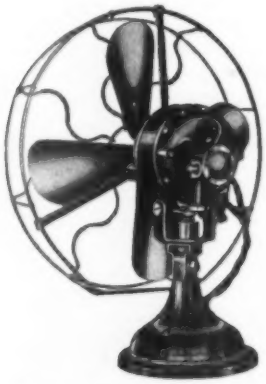
Century Electric Fans.

The fans listed this year by the Century Electric Company, St. Louis, Mo., consist of 12-inch and 16-inch desk and bracket and oscillating types, and a four-blade ceiling fan, built for all of the prevailing frequencies and commercial voltages.

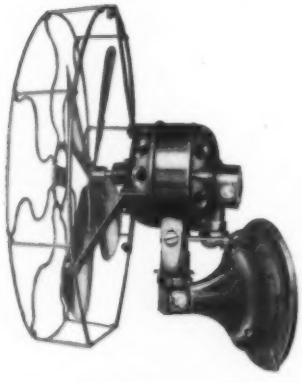
All of the desk, bracket, and oscillating fans are provided with a drawn-steel base, covered with green felt on the bottom to prevent marring furniture. The speed-regulating coil and switch containing five points, are lo-

cated in the base of the fan. The swivel and trunnion parts are also made of drawn steel.

The oscillating fan carries the same general construction as the desk and bracket fans, with the addition of a proper ball-bearing swivel and the oscillating mechanism. The latter consists of double steel worms and bronze gears which operate in a case packed with grease. The gears are of exceptionally liberal dimensions, practically insuring their life during the life of the remainder of the fan. An automatic release device is provided to protect the gears if the fan strikes any object during its ocillation. When the oscillator is tilted from other than horizontal position, the air is blown through the same plane throughout the range of oscillation.



Century Oscillator as Desk Fan.



Century Oscillator as Wall Fan.

The oscillating fan gives about four complete oscillations per minute, this speed having been selected in order that the fan might prove effective at more distant points than is possible when a fan oscillates six, eight or more times per minute. The speed reduction on desk and oscillating fans is about 40 per cent on 60-cycle circuits of normal voltage. The standard finish is black enamel all over, excepting the guards and blades, which are brass, dipped and lacquered.

The ceiling fan is practically the same design that has proven so satisfactory for the last ten years. The armature revolves outside of the field, and the entire weight is carried on ball bearings, which are immersed in oil. The blades have a sweep of 58 inches and a maximum speed of approximately 240 revolutions. Each fan is fitted with a two-speed switch. The oil cup is threaded for the reception of electrolier attachments, if such are desired.

Fidelity Electric Fans.

No striking departures were attempted in the present line of fans made by the Fidelity Electric Company, Lancaster, Pa. These motors have been on the market for many years and have met all expectations satisfactorily. Both alternating-current and direct-current fans are of the series type with commutator and brushes; the design has been so carefully worked out that the alternating fans operate with as little trouble as the direct-current fans. The swivel and trunnion construction has been used to give wide angular adjustment in both vertical and horizontal planes. Oscillating fans have a worm-gear mechanism. Most of the ceiling fans have a new type of bearing that is said to be practically frictionless without using oil.

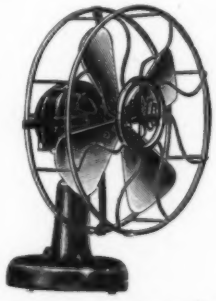
Fidelity Stand Fan, Showing Adjustability Feature.

The fan illustrated herewith is an eight-inch combination fan which this year is being made with a universal commutator motor that can be used on either 110-volt direct-current or 60-cycle alternating current of the same voltage. At the base of the stem there is a ball and socket joint which permits of easy and almost universal angular adjustment, including quick change from upright to wall position. The standard finish is black enamel for the body and polished brass for the trimmings. The Fidelity eight-inch silent-running telephone-booth fan is in extensive use and meeting the strict requirements of such service. The company also makes two types of eight-inch socket fans, one having an aluminum frame and weighing less than two pounds.

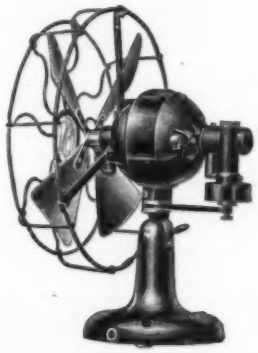
Mesco Direct-Current Fans.

In the design of the Mesco fan motors, which are made for 110 and 220 volts direct current, attention was given to attractiveness in appearance, as well as sturdiness of construction and reliability in operation. These fans are made in 8, 12 and 16-inch sizes, the two larger sizes being made both non-oscillating and oscillating. All of the fans are readily changed from desk to wall mounting and are also adjustable for intermediate and lower angles. Three speeds are obtainable on each fan.

The oscillators have their gear mechanism entirely inclosed in a dustproof, well proportioned and neat casing that is filled with grease to reduce friction to a minimum. The degree of oscillation can be easily adjusted from 0 to 110 degrees by merely loosening the thumb screw in the slot of the connecting rod. A slow, steady swing is given to the fan so as to permit it to work most effectively and with smooth and noiseless action.



Mesco Desk and Bracket Fan.



Mesco Oscillator.

Roto Electric Forge Blower.

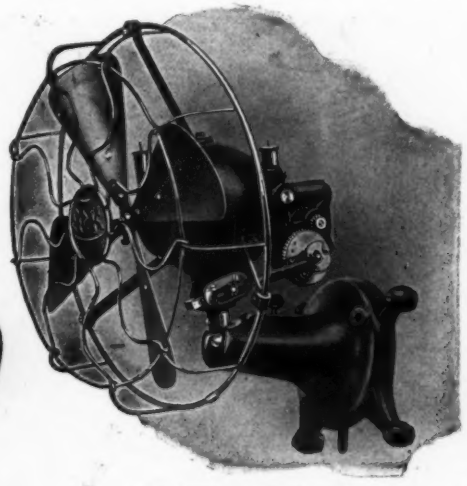
To furnish the blast for a forge by hand requires much labor and consumes a great deal of valuable time that could be put to effective use by the blacksmith. In large shops blowing equipments are therefore usually provided. In medium-sized shops with only a few forges an expensive equipment will operate at poor efficiency

when but one or two forges are in use. For such shops and for the small shops the most practical equipment is a separate blower outfit for each forge.

To meet the need for such an outfit, the Rosewater Electric Company, 3170 Croton Avenue, Cleveland, O., has placed on the market the Roto electric blower, which has been particularly designed for this service. It is a compact direct-connected set, with motor entirely inclosed in a dustproof case, which protects it from the coal dust, ashes, etc., usually met with in the smithy. The motor is of one-sixth horsepower rating and is series wound with a 24-bar commutator. A protected series speed regulator is arranged for mounting at any point convenient to the operator. This permits driving the blower for light, medium, heavy or extra heavy blast for horseshoeing, general blacksmithing and heavy wagon making requiring high welding heats.

The blower has an aluminum blade set designed to give an efficient and powerful blast with a minimum of weight on the bearings. Phosphor-bronze bearings of liberal dimensions are provided and these are lubricated by means of large oil cups of the self-feeding type to insure plenty of oil at all times. In operation the set is economical in power consumption, perfectly regulatable to requirements, and soon repays its first cost.

Direct-Connected Motor-Driven Blower With Regulator.



Eck Hurricane Oscillator.

Eck Electric Fans.

In its line of electric fans the Eck Dynamo & Motor Manufacturing Company, Belleville, N. J., has adhered to the rugged and durable construction that has given success to its well known fans in previous years. Comprised in this are the 12-inch and 16-inch Eck Hurricane oscillating and non-oscillating fans for direct current and for alternating current, the latter fan motors being of the induction self-starting type; eight-inch residence fans for direct current and for alternating current; 12-inch and 16-inch exhaust fans for direct current and for alternating current; 57, 54, 48, and 32-inch direct-current ceiling fans; and 60-inch alternating-current ceiling fans.

The Eck company prides itself particularly on its oscillating fans, which when introduced in 1907 were the first gear-operated oscillators. Practically the same mechanism has been used in all these years with excellent results. Striking features making for the success of this construction are the steel worm and bronze worm wheel incased in grease, the friction clutch safety device to prevent damage from accidental obstruction of the oscillation, the adjustability of the arc of the swing, the concealing and protection of the connecting wires in the hollow stem, etc. A universal joint between motor and base permits quick alteration of the angle of inclination and complete change from desk to wall position. All of the desk and bracket fans, whether oscillating or not, are provided with a three-speed rheostat switch. Quiet running is obtained at each speed.

Walker Vehicle Company Takes Over Chicago Electric.

As already announced in a preceding issue, the Walker Vehicle Company, manufacturer of the Walker balanced-drive electric commercial vehicles, has purchased the entire business and factory of the Chicago Electric Motor Car Company. Further particulars in regard to this merger are now available. The Walker company will continue the manufacture and sale of Chicago Electrics. The manufacturing plant will be concentrated in the Walker factory at 531-545 West Thirty-ninth Street, Chicago, where there are the most complete and up-to-date facilities for turning out high-grade product. The sales office, display rooms and service departments will be located in one of the most modern and artistic motor establishments, located at 2700 South Michigan Boulevard, Chicago. The business of the Chicago Electric Motor Car Company was purchased too late to permit securing desirable space in the Chicago Automobile Show held last week, and for that reason Chicago Electrics were exhibited at the general sales rooms.

For the past six years the Walker Vehicle Company has been successfully engaged in the manufacture of electric commercial cars. The new combination thus enables the Walker Vehicle Company to offer a complete line of electric cars, both pleasure and commercial, of the highest type.

William A. Fox, vice-president of the Commonwealth Edison Company, has been elected president of the Walker Vehicle Company; G. A. Freeman, also identified with the Commonwealth Edison Company, is vice-president of the Walker Vehicle Company. Practically the complete organization of the Chicago Electric Motor Car Company, including the factory and service force, has been continued with the Walker Vehicle Company. Gail Reed, formerly secretary and sales manager of the Chicago company, has been appointed general sales manager of the combined interests.

The Chicago Electric first entered the market in the year 1912, when the company was organized by Frederick J. Newman, one of the oldest and best known electric vehicle engineers, who first designed and built solid-tire electric cars. The construction of the Chicago Electric, being based on 14 years' experience in electric car building, met with immediate popular approval, and soon established for itself an enviable reputation.

The Chicago Electric line this year consists of three models. Of these, Models 151 and 153 are four-passenger limousines with rear-seat drive and unobstructed vision for the driver. The arrangement is such as to secure complete comfort for all four passengers. The driver and two passengers can occupy the spacious rear seat, still leaving ample freedom to operate the car. A fourth person can be seated on the

right front side on a comfortable revolving chair, while a fifth person may be carried on the left front side. The two models differ slightly in the front seating arrangement. These cars have 96-inch wheel base, and can be turned about completely in a street of 34-foot width.

Model 152 is a five-passenger limousine arranged for driving from the front seat. In this model there have been incorporated all the requirements to meet the demand for a spacious and luxurious five-passenger car. The front seats are of ample proportions to provide comfort and luxury. Even when the full quota of passengers is carried, each occupant has perfect comfort without cramping. The two front seats are located on a line with the center of the doors. As the result, the operator and the fifth person do not sit in a conspicuous position in the front of the car. The position of these seats is such as to afford convenient use of either door. While this car has unusual body length, it can be readily turned completely in a 38-foot street. Each of these Chicago Electrics has every improvement to increase the refinement, attractiveness and comfort of the cars.

Interior View of Chicago Electric, Model 152.

New Westinghouse Slip-Ring Induction Motor.

The Westinghouse Electric & Manufacturing Company has recently placed on the market a new line of large slip-ring induction motors for continuous service, such as driving pumps, blowers, compressors, hoists, and other machinery requiring heavy torque at starting. One of the chief characteristics of these motors is great strength. The frame is massive, the bearings and shaft extra large, and the windings securely braced against vibration. The bearings are dustproof and rest on three machined seats, a construction that has been found to be the best practice in steel-mill service.

Westinghouse Slip-Ring Induction Motor.

All coils are form-wound and completely insulated from ground before being placed in the slots. The stator slots are straight open; those of the rotor have an overhanging lip which assists in holding the coils in place, but the coils can be removed and replaced without bending as readily as with straight open slots. The shaft can be removed without disturbing the rotor winding. The bearing shell may be removed and replaced without taking off the lower half of the bearing bracket. The brushes are readily accessible, as shown by the illustration.

Rotor of New Slip-Ring Induction Motor.

Palmer Inclosed Service Switch and Meter-Protecting Device.

Modern engineering practice and municipal safety regulations require all conductors to be inclosed in metallic conduit. Installations so equipped have been found to be a source of real economy. This progress has naturally made necessary the development of modern protected switches and cutouts.

The Palmer inclosed service switch has been designed to offer maximum protection against unauthorized interference, obtaining unmetered current, fire hazard, injury or damage due to accidental contact with live parts, interruption of service, etc. It consists of a switch-cutout using standard fuses and a sealable metallic box. The switch mechanism is of a double-break knife-blade type, operating without the use of springs. The fuses and all accessible energy-carrying parts are dead when exposed, and the danger of shock when installing fuses is consequently eliminated. The switch mechanism may be sealed in closed or open position or may be left unsealed, so that the consumer can renew the fuses when they become defective or blow out. The box in which this unit is mounted is equipped with interchangeable conduit knockouts at each end and sides, permitting the use of several sizes of conduit.

Fig. 1 shows a 30-ampere, three-pole service switch mounted in connection with a Palmer adapter block and a modern type of bottom-terminal meter. Suitable openings are provided on the house side of the switch to permit open wiring of the house circuits. For meter protection provision is made on the end of the switch box to fasten metallic meter adapters, which are

made to conform to the different shapes of the various watt-hour meters now on the market. These adapters completely cover and protect all of the conductors around the meter, preventing any method of unauthorized interference or tampering.

Fig. 2 shows the type of switch furnished in various capacities from 61 to 600 amperes. In this type of switch either outside leg in an Edison three-wire service may be re-fused without interrupting the service on the other leg. The detector button *B* enables the operator to determine whether or not a fuse has been blown in either outside leg without exposing the fuse for inspection, an operation which in any device of this character must necessarily interrupt the flow of current.

These switches and protective devices are manufactured by the Palmer Electric & Manufacturing Company, 161 Franklin Street, Boston, Mass.

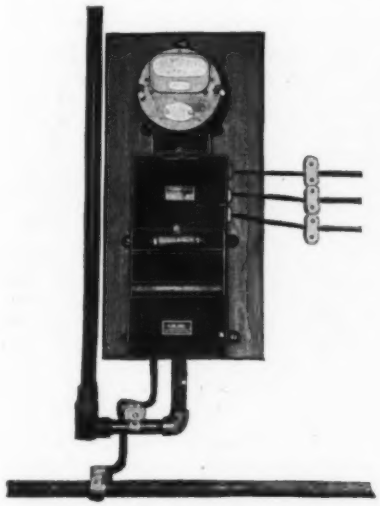


Fig. 1.—Palmer Service Switch and Meter Protector.

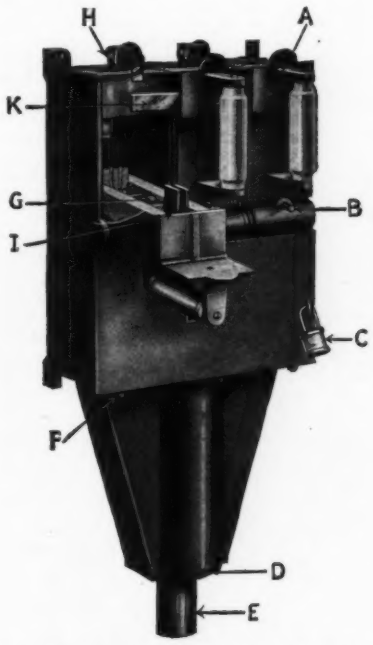


Fig. 2.—Palmer Inclosed Service Switch.

Schweitzer Automatic Instantaneous Voltage Regulator.

The Schweitzer automatic instantaneous voltage regulator is intended to be used with a step-down transformer so that the one transformer may supply both light and motor service and still maintain constant voltage at the lamps, even though the motor load is variable over wide limits. The use of the regulator will make permissible the following conditions: first, a single transformer supplying one customer with both light and motor service; second, a single transformer supplying several customers with lighting service and also supplying the same or nearby customers with motor service.

In the first case, if the regulator should be installed on the customer's premises on the load side of the meter, the resultant saving would be one transformer, one set of secondary mains and service wires, and one meter and maintenance of same. In the second case, the transformer and regulator should be located nearest to the largest power customer in the neighborhood to be supplied by the one transformer; then the saving would be one transformer and probable shortening of power secondary mains, depending on the location of the present power transformer with reference to the power customers.

The particular value of the regulator is to compensate for the effect of starting of motors, as the heavy starting current of alternating-current motors causes for a few seconds an excessive drop in voltage and consequent poor lighting service that under present conditions requires a separate transformer.

The following values are from a test made by starting a two-horsepower repulsion-type motor, the supply being at 115 volts, nominal, from a three-kilowatt transformer over long secondary leads. The lamp load of 18 80-watt lamps was kept constant.

Volts at service switch.	Volts at lamps.	
116.0	113.5	Motor stopped.
93.0	112.5	Motor starting.
112.0	113.0	Motor running light.

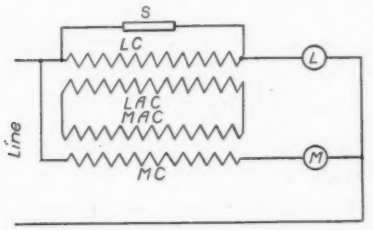
Without the regulator the pressure at the service switch and lamps dropped to 90 volts when the motor was started. By means of the regulator, however, the pressure at the lamps was held within one volt even though there was a 26-volt drop in service pressure due to motor starting.

On a circuit of better regulation the following results were obtained, the lamp load being the same as before.

Volts at service switch	Volts at lamps.	
121.0	120.0	Motor stopped.
113.0	119.3	Motor starting.
121.0	121.0	Motor running light.

Without the regulator, the pressure at the service switch and lamps dropped to 111 volts at motor start. With the regulator, the lamp voltage dropped only 0.7 volt at motor start.

The regulator is constructed similarly to a core-type transformer, four coils being used and all wound of heavy copper since the regulator is placed in series with the load. Two coils are wound on each leg of the core, one coil being used as a main coil and the other on the same leg of the core as a compensating or auxiliary coil. One main coil, the lamp coil, or *LC*, is connected in series with the lighting load; the other main coil, the motor coil, or *MC*, is connected in series with the motor load, and the two auxiliary coils, *LAC* and *MAC*, are connected in opposition. A non-inductive shunt is placed across the lamp coil to adjust the regulator for various conditions of line drop, but when the shunt is once adjusted for a given line and transformer constant voltage will be maintained on the lamp circuits for all motor loads.



Connections of Schweitzer Voltage Regulator.

For use on three-wire services the lamp coil is divided into two parts insulated from each other and one part connected in each outside lighting secondary. These regulators are manufactured by Schweitzer & Conrad, 1774 Wilson Avenue, Chicago, Ill.

Electrical Machinery in Japan.

Hitherto most of the dynamos and other electrical machinery in Japan have been supplied by the General Electric, Westinghouse and Siemen-Schuckert companies. The Tone Electric Company, however, is making a notable departure, having ordered dynamos of 6,000 kilowatts in Japan. These machines are to be made by the Hitachi Works, and the iron pipes for the same power installation are to be supplied by the Shibaura Works.

Current Electrical News

ATLANTIC STATES.

PITTSFIELD, MASS.—Superintendent Cummings, of the fire alarm and police signal systems, has applied to the city government for additional apparatus. The replacing of iron standards for the present wooden posts is recommended, and three new non-interfering boxes are asked for. W.

SPRINGFIELD, MASS.—Chief Daggett, of the city fire department, has applied to the city government for three electric aerial ladder trucks. W.

EASTON, PA.—In his annual report to city council, Fire Chief T. P. Ricker has recommended that all fire-alarm circuits in the business section of this city be placed underground. Dr. B. Rush Field is superintendent of the Department of Public Safety.

FREDERICK, MD.—An expenditure of $40,000 is being advocated by Alderman Elmer M. Phebus to put the city light plant in first class condition.

DARIEN, GA.—The Darien Manufacturing Company has organized with Charles M. Tyson, president. The company will operate ice plant, electric light plant, sawmill and planing mill; ice and lighting plants will be moved to the site of properties of Darien Saw Mill Company.

NORTH CENTRAL STATES.

NORWALK, O.—A municipal electric power plant will be constructed by the city out of the proceeds of a bond issue of $100,000, which will be disposed of shortly for that purpose. Bids are being received for the bonds, and as soon as they are sold arrangements will be made for letting the construction of the plant.

NEW ALBANY, IND.—The Electric Popcorn Machine Company, of Indianapolis, with a capital of $100,000, has been organized and is to establish a plant to manufacture the machines in New Albany. The proposal of the company is to put them out on leases, which, it is believed, would result in a larger business than if the sales were made outright. F. H. Kahler has been conducting the negotiations which will bring the plant to the city.

CADILLAC, MICH.—The Retail Merchants' Association is behind an agitation to secure ornamental street lighting for Cadillac. Joseph Widgren, president of the Association, is particularly interested.

MARQUETTE, MICH.—It is understood that the city light and power plant at Dead River near Marquette, is being operated to its capacity. Superintendent Charles Retallic of the light and power department will recommend the building of a new power house.

SAGINAW, MICH.—A special election will be held on February 17 to submit the $750,000 bonding proposition for a municipal lighting plant.

MINNEAPOLIS, MINN.—The city council at its meeting January 29, passed a resolution asking the State Legislature for authority to sell $100,000 worth of bonds to finance installation of equipment that will double the capacity of the electric lighting and heating plant, and enlarge the crematory. About $75,000 of the amount is asked for the lighting and heating plant. The enlargement is expected to enable the department to generate sufficent electricity to maintain 200 street lamps, and bring in annual revenue amounting to $12,000. By utilizing the heat from the incinerators at the crematory, or by converting garbage into electricity, the cost of disposing of garbage last year was reduced by 47.7 cents per ton.

ST. PAUL, MINN.—In his report to the city council, January 23, Superintendent Joseph Macauley, of the police and fire alarm systems, recommends the installation of motor-generators to take the place of batteries in the police alarm system. He also asks that 13 miles of wire be put in and that reliable modern recording systems be purchased to replace those at present in use.

IRWIN, IOWA.—At the local election the proposal to issue $6,000 worth of bonds for electric service, which will be obtained from Manilla, was carried.

NATOMA, KANS.—The sale of bonds for the construction of a lighting plant and water system in Natoma has been arranged for and the F. D. Martin Construction Company, of Kansas City, is prepared to begin the work as soon as weather conditions permit. The bonds were taken at par by the school fund of the State, a fact which has attracted favorable notice for the town because the bonds are issued by a community of only 400 population. The issue amounts to $28,000. W. B. Rollins & Company are the engineers.

SOUTH CENTRAL STATES.

FT. THOMAS, KY.—Local citizens are planning the organization of a company to build an electric plant to supply the town with current, it being understood that the council is willing to grant a franchise for that purpose, instead of securing current from some other company. A site for the plant has been selected. L.

LAWRENCEBURG, KY.—Business men of this city have organized a movement looking toward the installation of a "white way." A committee, headed by D. L. Moore, Jr., has been getting subscriptions to the plan which are numerous enough to insure success of the project. The committee hopes to provide for at least 16 of the five-lamp standards.

CAMDEN, TENN.—Camden's new electric light plant was destroyed by fire, the loss being about $3,000, with insurance of $1,500. The plant was a private enterprise operated by I. S. Madrey & Son.

COLUMBIA, TENN.—Prospects are that the city will shortly take over the water plant of the Columbia Water and Light Company, according to plans which were formed a year and a half ago when the city voted $100,000 in bonds to pay for the property. Appraisers are working on the proposition and it is said that the findings of each are likely to agree.

SHELBYVILLE, TENN.—It is reported that the Tennessee Power Company has purchased the local electric light plant, taking charge on the first of February. It is understood that the contract with the city will be renewed and that the new company will make extensive improvements. It is stated also that the new owners of the electric light plant will take charge of the water works and that this will be electrically operated. Power will come from the hydroelectric plant on the Tennessee River.

SNYDER, TEX.—The Snyder electric light plant has been sold to E. F. Renken. It is understood that $15,000 will be spent in improvements.

BROWNSVILLE, TEX.—The City Council has authorized the Light and Water Department to install an ornamental street-lighting system in the business district. Address A. A. Brown, mayor.

WESTERN STATES.

FORT BENTON, MONT.—It is understood that the city has placed $50,000 in bonds, a considerable portion of the proceeds of which is to be used for the building of an electric light plant. Joseph S. Brown is mayor of the city.

GALLUP, N. M.—Kennet Meyers, manager of the Peoples Light Company, has verified the report that the company has passed back to the original owners, and that extensive improvements are planned.

SANTA FE, N. M.—State Engineer French has granted the Socorro Power and Light Company an extension of time to June 16, 1916, for the completion of its power project on Mineral Creek in Socorro County.

DEARY, IDAHO.—Roy Drury, of this city, has been granted a franchise by the city council to install and operate an electric lighting system, and it is reported a power plant will be installed in the plant of the Deary Lumber Company. Work is to begin as soon as materials can be placed on the ground, it is said. O.

GREEN RIVER, UTAH.—After a further consideration of bids submitted to them for the construction of the electric light plant here, the city council has awarded the contract to the Green Construction Company of Salt Lake City, on a bid of $16,500.

HUNTINGTON, UTAH.—At a meeting of the directors of the Huntington Canal and Reservoir Company matters pertaining to amend the articles of incorporation so that the company would be able to install a power plant, was dis-

cussed, and on motion the directors were instructed to prepare a draft of the proposed amendment and submit same to the stockholders.

BAKER, ORE.—Because the Eastern Oregon Light and Power Company agreed to reduce the charge of lighting from 15 cents per kilowatt-hour to 9 cents per kilowatt-hour, the city has decided not to place before the voters the proposition of issuing bonds in the sum of $180,000, to be used in extending and enlarging the present municipal light and power plant. The city of Baker, at this time, owns a plant which furnishes current for street lighting and illuminating municipal buildings. O.

LEXINGTON, ORE.—It is reported that J. V. Sparks, of Lexington, will install a small electric light and power plant here, for the purpose of serving local business houses and residences and contiguous territory. O.

ANAHEIM, CAL.—The first civic improvement of the year will be the installation of an ornamental lighting system in the business district.

LINDSAY, CAL.—At a meeting of the stockholders of the Tulare County Power Company, which maintains 415 miles of transmission lines in Tulare County, operates 625 pumping plants, and furnishes electric current to the towns of Lindsay, Tulare, Exeter, Tipton, Strathmore and Pixley, it was decided for stockholders to make a loan to the company sufficient to pay off all outstanding indebtedness. The loan will be made in three equal installments, the first of which was paid on February 1, the second to be paid on July 1, and the third on February 1, 1916.

SAN FRANCISCO, CAL.—E. B. Bumsted, general manager of the California Power and Manufacturing Company, has gone to Fall River Mills, the seat of the company's construction work, where it is proposed to resume work on the installation of transmission lines as soon as weather conditions permit.

PROPOSALS.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until March 11, for the installation complete of an electric passenger elevator in the experimental station, Bureau of Mines, Pittsburgh, Pa., in accordance with the drawing and specification, copies of which may be had by application to the Supervising Architect, Washington, D. C.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until February 25, for the installation complete of an electric passenger elevator in the United States post office and courthouse at Clarksdale, Miss., in accordance with drawing and specification, copies of which may be had by application to the supervising architect.

LIGHTING FIXTURES.—Sealed proposals will be received at the Supervising Architect's Office, Treasury Department, Washington, D. C., until February 15, for furnishing and installing lighting fixtures in the United States post office at Bangor, Me., the United States post office at Berkeley, Cal., the United States post office and courthouse at Chickasha, Okla., the United States post office and courthouse at Clarksdale, Miss., the United States post office and courthouse at Minot, N. Dak., the United States post office at New Bedford, Mass., the United States post office at Piqua, Ohio, and the United States post office at Winston-Salem, N. C., in accordance with drawings and specifications, copies of which may be had from the supervising architect.

ENGINE-DRIVEN GENERATOR EQUIPMENT.—Sealed proposals will be received by the City Council at its office, in the City Hall, Garrett, Ind., until eight o'clock p. m., March 4, 1915, for the construction, delivery and erection of one steam-engine-driven generator unit of 200 kilovolt-ampere capacity, 200 revolutions per minute, three-phase, 2,300 volts, 60 cycles, with the necessary exciter, switchboard and other accessories in every way complete for continuous service, upon proper foundations, in the engine room of the Electric Lighting Station in the City of Garrett, Ind. The Common Council reserves the right to reject any and all bids. Proposals should state separate and combined price of engine, generator and accessories. W. W. Mountz, city clerk.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained by writing (mentioning file numbers) to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or to the nearest of its branches at Bosotn, New York, Atlanta, Chicago, New Orleans, Seattle and San Francisco.]

NO. 15,419. TELEPHONES.—An American consular officer in the Near East has transmitted a report relative an opportunity to secure contracts for the installation of an extensive telephone system. A copy of the complete report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

NO. 15,455. TELEPHONE SUPPLIES.—A firm in Europe has informed an American consul that it wishes to negotiate for the purchase of paper-insulated telephone cables, galvanized-iron wire, and porcelain insulators for telephone lines.

NO. 15,459. LOCOMOTIVE, ELECTRICAL MACHINERY, ETC.—An American consular officer in the Far East reports that a merchant in his district desires to receive catalogs, price lists, etc., on locomotives, dynamos and electric lamps. He is in the market for a locomotive of from 40 to 60 horsepower; a dynamo, three-wire system, direct-current; and lamps of 14 and 220 volts.

NO. 15,473. ELECTRICAL MACHINERY, FIXTURES AND SUPPLIES.—An American consular officer in Italy reports that a firm in his district desires to communicate with American manufacturers of electrical machinery, fixtures and supplies. Correspondence should be in Italian.

FINANCIAL NOTES.

Immediately following the annual meeting of the Electric Bond & Share Company, which will be held at Schenectady, February 17, the board of directors has called a special meeting of stockholders for the purpose of increasing the capitalization of the company from $10,000,000 to $16,000,000 by authorizing an additional $3,000,000 six-per-cent preferred stock and an additional $3,000,000 common stock.

At a meeting of the board of directors of the United Gas & Electric Engineering Corporation, George Bullock resigned as president and was elected chairman of the board of directors to take effect February 1; J. S. Pevear was elected president to succeed Mr. Bullock and S. J. Dill, vice-president, was placed in charge of the New Orleans office of the company. These changes in the subsidiary company would appear to bear out the report that at the annual meeting of the United Gas & Electric Corporation of Connecticut Mr. Bullock will retire as president of that company to become chairman of the board and will be succeeded by Mr. Pevear, who has been president of the New Orleans Railway & Light Company and is now president of Birmingham Light & Power Company.

Dividends.

	Term.	Rate.	Payable.
Boston Elev.	Q	1.5 %	Feb. 15
Mobile Elec., pf.	Q	1.75%	Feb. 15
Ohio Trac., pf.	Q	1.25%	Feb. 1
Phila. Co. 5% pf.	S-A	2.5 %	Mch. 1
So. Cal. Edison	Q	1.5 %	Feb. 15
White Eng. J. G., pf.	Q	1.75%	Mch. 1
White Man. J. G., pf.	Q	1.75%	Mch. 1

Reports of Earnings.

NIAGARA FALLS POWER.

Niagara Falls Power Company and the Canadian Niagara Falls Power Company report income account for last year thus:

	1914.	1913.
Gross earnings	$2,675,974	$2,742,192
Operating expenses and depreciation	513,508	540,265
Net profits for year	*357,516	319,077
Other income	82,887	116,058
Gross income	2,245,352	2,317,985
Fixed charges, taxes, insurance and rentals	1,275,809	1,247,875
Surplus	969,543	1,070,109

MASSACHUSETTS ELECTRIC.

The Massachusetts Electric Companies report for the quarter and six months ending December 31, 1914, as follows:

	1914.	1913.
Gross	$2,253,978	$2,233,491
Net	562,538	601,763
Surplus	58,714	121,489
Gross	5,189,976	5,167,436
Net	1,742,575	1,787,901
Surplus	708,792	789,696

GREAT WESTERN POWER COMPANY.

	1914.	1913.
December gross	$ 245,876	$ 245,226
Net	174,300	158,790
Surplus after charges.	72,480	72,163
12 months' gross	2,681,098	2,698,214
Net	1,807,335	1,732,244
Surplus after charges.	659,102	627,563

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 1	Jan. 25
American Tel. & Tel. (New York)	120½	120½
Commonwealth Edison (Chicago)	136⅝	—
Edison Electric Illuminating (Boston)	257	258
Electric Storage Battery common (Philadelphia)	47½	48½
Electric Storage Battery preferred (Philadelphia)	47½	48½
General Electric (New York)	143	144½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	7¾	7½
Massachusetts Electric preferred (Boston)	48	46¾
National Carbon common (Chicago)	—	124½
National Carbon preferred (Chicago)	121	121½
New England Telephone (Boston)	137	137
Philadelphia Electric (Philadelphia)	23⅜	23¼
Postal Telegraph and Cables common (New York)	70	70
Postal Telegraph and Cables preferred (New York)	67½	67½
Western Union common (New York)	63¼	62¾
Westinghouse common (New York)	71	71½
Westinghouse preferred (New York)	117	118

PERSONAL MENTION.

MR. H. A. WAGNER has been elected president of the Consolidated Gas, Electric Light and Power Company, of Baltimore, Md., succeeding Mr. J. E. Aldred, resigned.

MR. THOMAS H. DWYER, until recently chief engineer of the Great Northern Power Company's Virginia, Minn., plant, left January 19 for Detroit, Mich., to take a position with a large engineering firm.

MR. GEORGE H. MORSE, formerly professor of electrical engineering at the University of Minnesota, is now located with the Mutual Electric and Machine Company, of Wheeling, W. Va., engaged in the designing and manufacturing of electrical machinery.

MR. HENRY VINTON NEAL, a mechanic in the shops of the Boston Elevated Railway, was announced the winner of the Anthony N. Brady memorial medal for safety work, at the annual dinner of the American Electric Railway Association at Washington, D. C., January 29.

MR. A. B. WILSON, until recently connected with the General Electric Company in the Holophane branch, has established offices in the Leader Building, Cleveland, O., for the marketing of electrical devices and specialties. Mr. Wilson has for some time past been a leading member of the Cleveland Advertising Club and has worked out a number of ideas for popularizing the use of current-consuming devices.

MR. LEROY PARKER, for a number of years auditor of the United States Telephone Company, the Columbus Citizens' Telephone Company and other companies now merged in the Ohio State Telephone Company, has been made comptroller of the consolidated organization, with headquarters at Columbus. Mr. C. J. Queen, who has been Mr. Parker's assistant, becomes general auditor of the consolidated organization.

MR. GUY E. MARION has severed his connection with Arthur D. Little, Incorporated, Boston, Mass., to establish the Special Libraries Association, of which he has become secretary-treasurer. Mr. Marion was for five years in charge of the information department of Arthur D. Little, Incorporated, and previous to that period was connected with several large manufacturing organizations in charge of information-bureau work.

MR. FRANK C. SMITH, for a number of years sales manager of the Western district for the American Conduit Company, has accepted a position with the Chicago office of the Fibre Conduit Company, manufacturers of "Orangeburg" fibre conduit, as assistant to W. Smythe, Jr., Western manager. Mr. Smith is calling on his friends and acquaintances in the electrical field and will be glad to lend his assistance to those contemplating conduit installations.

MR. CHARLES E. POYER has been appointed assistant general sales manager of the Edison Storage Battery Company. Mr. Poyer has been with the Edison interests for about four years, having served first on the personal engineering staff of Mr. Edison in the development of special application of the alkaline battery, and later as assistant advertising manager. For the past two years he has been manager of the house lighting department, and the rapid development of this branch of the business both from an engineering and commercial standpoint is attributable to his ability. His promotion will enable Mr. William G. Bee, vice-president and general sales manager, to give more of his personal attention to the advancement of the electric-vehicle field and permit closer co-operation with the vehicle and other manufacturers.

MR. O. V. ANDERSON, who prior to accepting the position of superintendent of electrical construction with the Toronto Power Company was located in Minneapolis, has finished a complete reorganization and reconstruction of the electric plant at London, Ont. The old 125-cycle and 1,100-volt alternating-current system has been replaced by a 60-cycle, 2,200-volt system. In addition, the direct-current system has been entirely rebuilt, so that the present capacity of the plant is 1,700 kilowatts, alternating current, and 1,350 kilowatts, direct current. Mr. Anderson has had complete charge of the work, and has carried out the extensive reconstruction plans without interruption of the plant's service. The business department has also been reorganized and placed on an efficiency basis.

OBITUARY.

MR. JOHN M. MACK, for several years a leading figure in public utility financing, died at his home in Philadelphia on January 26.

DR. CYRUS F. BRACKETT, professor emeritus of physics at Princeton University, died suddenly at Princeton, N. J., on January 30 at the age of 81 years. Dr. Brackett was born at Parsonfield, Me. He graduated from Bowdoin College in 1859. He received the honorary degree of LL. D from Bowdoin, Lafayette College and Princeton. In 1863 he received the degree of M. D. from Bowdoin. Dr. Brackett was professor of chemistry at Bowdoin College from 1864 to 1873. Subsequently he was professor of physics at Princeton University for 35 years. He contributed a great deal to the literature of chemistry, electricity and magnetism, and was the joint author with Dr. William A. Anthony of a noted text-book on physics.

DATES AHEAD.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 17-19. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

"Made in the U. S. A." Industrial Exposition. Grand Central Palace, New York City, March 6-13. President, H. A. Cochrane, Fifth Avenue Building, New York, N. Y.

New England Section, National Electric Light Association. Question Box convention. City Club, Boston, Mass., March 9-10. Secretary, Miss O. A. Bursiel, Boston, Mass.

Minnesota Electric Association. Annual meeting, St. Paul, Minn., March 23-25. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

National Electric Light Association. Annual convention, San Francisco, Cal., June 7-11. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The E. T. Chapin Company, producers of Bovill poles, announces the removal of its sales office from Bovill, Idaho, to the Columbia Building, Spokane, Wash.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued descriptive leaflet No. 3767, which covers magnet switch starters for alternating-current motors, provided with either squirrel-cage or slip-ring rotors. This type of switch, which has become quite popular for industrial applications, is thoroughly described and illustrated in the leaflet.

Delta-Star Electric Company, 625 West Jackson Boulevard, Chicago, has ready for distribution bulletin No. 20, which deals with high-capacity, high-tension, outdoor substation switching and protective units, S. & C. lightning arresters, pole-top air-break switches, etc. Views are shown of this varied equipment, as well as of typical complete substations in which the apparatus is used.

The Terry Steam Turbine Company, Hartford, Conn., announces the appointment of Earl F. Scott as representative in the state of Georgia, with offices at 702 Candler Building, Atlanta. The Pittsburgh offices, in charge of H. A. Rapelye, is now located at 1624 Oliver Building. The company has recently issued a 64-page bulletin entitled "Centrifugal Pumps," giving details and data on various turbo-pump applications.

The Jefferson Electric Manufacturing Company, 847-851 West Harrison Street, Chicago, Ill., has been incorporated by J. A. Bennan, formerly treasurer and general manager of the Thordarson Electric Manufacturing Company. The new company will manufacture a complete line of bell-ringing, sign-lighting, toy and welding transformers, battery switches, steel battery box outfits, ignition coils and high-tension transformers for laboratory research and testing work.

The Cutter Company, Philadelphia, Pa., has ready for distribution among operating engineers and electricians,

a cleverly prepared book entitled "When a Fuse Blows." It contains a simple engineering narrative of particular interest to men in charge of the successful operation of switchboards and many motors. The story points out the convenience, reliability and ultimate economy of using Cutter I-T-E circuit-breakers in place of fuses and shows a large variety of these devices, as well as of typical installations where they are used.

The Western Electric Company, New York, N. Y., which supplied all of the line construction material and telephone apparatus used for the transcontinental telephone line, has issued an attractive folder showing a map of the line, views taken during its construction, and also reproductions of drawings and photographs depicting the opening of the first long-distance line between Salem and Boston in 1877, the line between New York and Chicago in 1892, and that between New York and Denver in 1911. It is entitled "Transcontinental Voice Highway."

The General Insulate Company, Brooklyn, N. Y., held its annual meeting on January 27, at which the following officers were re-elected: President, Joseph Steinberger; vice-president, E. J. Kaltenbach; treasurer, James B. Stephens. The reports to the stockholders show that whereas in company with practically all other industries, the General Insulate Company has been affected by the European war, nevertheless in 1914 the company's business fell but little below the previous year, which was the banner one in the company's existence in net returns and in gross sales. The company states that the outlook for the present year seems very bright, orders being freely offered from all directions.

Harrison Safety Boiler Works, Philadelphia, Pa., has issued "Cochrane Multiport Valves," a booklet of 72 pages which describes the multiport valves introduced by that concern for back-pressure relief and vacuum service, flow service in connection with mixed-flow turbines, and check-valve service with bleeder or extraction turbines. The essential idea of the multiport valve is the use of a number of small disks instead of one large disk, in order to secure greater safety, quietness, lightness of moving parts, and tightness. The several disks are each fitted with an independent dashpot held to its seat by independent springs, the tension of all the springs being adjusted simultaneously by a pressure plate. In addition to full descriptive and tabular matter, the book contains numerous diagrams and layouts, also data on effects of air in condensers, etc.

Record of Electrical Patents.

Issued by the United States Patent Office, January 26, 1915.

1,125,936. Electric Safety Appliance. C. A. Benedict, Bellvale, N. Y. Expansion of bar due to abnormal current opens circuit-breaker.

1,125,944. Adapter for Axle-Driven Generators. W. L. Bliss, N. Y., assignor to Central Trust Company of New York. Generator mounting to provide for automatic belt tightening.

1,125,947. Indicator for Party-Line Telephones. E. Bowman, Elmwood, Ont., Canada, assignor of one-half to C. R. Miller. Vibratory spring sounder operated by a movement of the receiver hook.

1,125,948. Elevator Safety Device. T. T. Boyle, assignor to Deadlock Elevator Safety Co., Detroit, Mich. Door-actuated circuit-breaker.

1,125,952. Switch-Support. H. H. Brown, Passaic, N. J. Push-button at end of bracket with wire-receiving channel.

1,125,954. Telephone-Exchange System. S. H. Browne, assignor to American Telephone & Telegraph Co. Includes automatic switch for distributing the calls first among a group of preferred trunks.

1,125,965. Automatic Switching System. E. H. Clark, assignor to Western Electric Co. Automatic selector switches at ends of trunks move in unison.

1,125,970. Primary Battery. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. Diagonally connected vents in top of cell.

1,125,971. Ignition Apparatus for Internal-Combustion Engines. I. J. Daily, assignor to Henricks Novelty Co., Indianapolis, Ind. Coiled spring connection between driving pulley and inductor shaft of generator.

1,125,997. Selective Signaling System. J. C. Field, assignor to Western Electric Co. For telephone train-dispatching.

1,126,007. Electric Signaling Apparatus and Circuits. F. B. Herzog, New York, N. Y.; H. Herzog, executrix of said F. B. Herzog, deceased. Step-by-step controlled indicator and interconnected counter.

1,126,009. Selective Signaling Device. R. N. Hill, assignor to Western Electric Co. Covers details of step-by-step selector.

1,126,016. Electric-Current Economizer. W. L. Imlay, New York, N. Y. Brush of distributor is not thrown into contact until predetermined speed is reached.

1,126,018. Trolley-Finder. R. Jacobucci, Fall River, Mass. Lazy tongs with jaws standing astride the trolley wire.

1,126,027. Apparatus for Detecting Pipe-Leads or Other Metallic Masses Embedded in Masonry. M. Jüllig, Vienna, Austria-Hungary. Includes a pair of exploring coils adapted to act inductively on each other through a telephone receiver and indicator.

1,126,043. Circuit-Controller. A. C. Livermore, assignor to Union Switch & Signal Co., Swissvale, Pa. Cam-operated signal controller with three positions.

1,126,046. Telephone System. F. R. McBerty, assignor to Western Electric Co. Automatic trunking system.

1,126,047. Telephone-Exchange System. F. R. McBerty, assignor to Western Electric Co. Has special automatic selector switch.

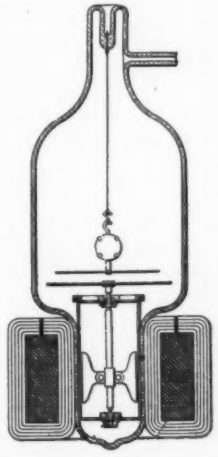
1,126,048. Telephone Switching Apparatus. F. R. McBerty, assignor to Western Electric Co. Automatic selective switch.

1,126,059. Power-Transmission System. W. Morrison, Des Moines, Iowa. Automobile transmission consists of dynamo-electric clutch with revolving field and armature, the latter connected to storage battery so as also to be capable of acting as starting motor.

1,126,060. Centrifugally Regulated Power-Transmission System. W. Morrison. Dynamo-electric clutch with centrifugal brushes arranged to assist in magnetic clutching action.

1,126,061. Dynamo-Electric Clutch. W. Morrison. Further details of shunt-wound clutch.

1,126,079. Casting Metals of High Melting-Point. A. L. J. Queneau, assignor to P. Wetherill, Edgewater Park, N. J. Electric casting furnace.



No. 1,126,233.—Electric Vacuum Gauge.

1,126,084. Mechanical Movement. G. E. Reisbach, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Ratchet wheel is operated in either direction by the interconnected action of two solenoids.

1,126,092. Automatic Section-Switch. W. Schaake, assignor to Westinghouse Electric & Mfg. Co. Spring-actuated plunger operates quick-break switch.

1,126,095. Transmitting Apparatus for Submarine Signals. J. Schiessler, Baden, near Vienna, Austria-Hungary. Includes electrically vibrated tuned sound producer, a resonator and submerged parabolic sound reflector.

1,126,112. Insulated Rail-Joint. R. W. Smith and W. P. Thomson, assignors to Rail Joint Co., New York, N. Y. Has insulating filler members and base and bolt insulating plates.

1,126,120. Desk Stand. C. G. Stoll, assignor to Western Electric Co. Transmitter casing lug holder with opening for switch hook.

1,126,122. Electric Railway Safety System. M. Strang, Tecumseh, Mich. Crossing danger signal controlled by car entering and leaving the section.

1,126,143. Resilient Driving Connection. J. E. Webster, assignor to Westinghouse Electric & Mfg. Co. Between railway motor and wheel axle.

1,126,145. Signal Apparatus. W. H. Wells and J. R. McCumber, Victoria, Va. Closing of signal electrically actuates a puncturing recorder.

1,126,161. Bond-Distributer for Mica Towers. H. R. Edgecomb, assignor to Westinghouse Electric & Mfg. Co. Distributes powdered mica evenly on a moving belt.

1,126,162. Clamp. C. H. Davis, assignor to Westinghouse Electric & Mfg. Co. For holding trolley ear.

1,126,163. System of Electric-Motor Control. W. Cooper, assignor to Westinghouse Electric & Mfg. Co. Relay switches delay the operation of accelerating switches.

1,126,173. Telephone-Exchange System. J. L. Wright, assignor to National Engineering Corporation, Washington, D. C. Automatic number transmitter for decimal digit system.

1,126,178. Train-Signal System. W. E. Benn, McAdam Junction, N. B., Canada, assignor of one-half to G. E. Davis and W. B. Hall. Electric signal for air-brake-hose coupling.

1,126,184. Automatic Storage-Battery Lighting System. C. A. Dawley, Plainfield, N. J. Resistance and counter E. M. F. cells are arranged to permit charging the battery while generator is also supplying lighting circuits.

1,126,193. Spring Jack. O. M. Glunt, assignor to Western Electric Co. For telephone switchboard.

1,126,198. Control System for Electric Motors. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co. Low-voltage control system for series-multiple railway-motor equipment.

1,126,199. Fire-Alarm Transmitter. W. R. Hamilton, assignor to Dominion Gresham Guarantee & Casualty Co., Montreal, Canada. Auxiliary to alarm-transmitting system are means for detecting breaks in circuit.

1,126,200. Fire-Alarm-Transmitter Movement. W. R. Hamilton, assignor to Dominion Gresham Guarantee & Casualty Co. Covers details of equipment.

1,126,206. Railway Signaling System. L. A Hawkins, assignor to Union Switch & Signal Co. Special circuit interconnection of adjoining block sections.

1,126,221. Switch-Latching Mechanism. E. H. Jacobs, assignor to General Electric Co. Solenoid-controlled toggle for electric switch.

1,126,233. Vacuum Gauge. I. Langmuir, assignor to General Electric Co. In evacuated vessel is a motor-driven disk above which is a mica disk suspended by quartz fiber. (See cut.)

1,126,235. Controlling Means for Motor-Driven Machines. R. K. Le Blond and W.

F. Groene, assignors to R. K. Le Blond Machine Tool Co., Cincinnati, O. Motor-driven lathe with means on spindle for throwing off clutch and simultaneously applying the brake.

1,126,266. Igniting System. H. G. Osburn, Pittsburgh, Pa. Magneto and battery system.

1,126,267. Outlet Fixture. H. T. Paiste, assignor to H. T. Paiste Co., Philadelphia, Pa. Fixture-supporting cross bar fits into recesses in flanged ceiling ring.

1,126,272. Signal. A. G. Remhilt, Philadelphia, Pa. Electromagnetically actuated rotating indicator.

1,126,286. Alternating-Current-Measuring Instrument. F. W. Roller, East Orange, N. J., assignor to Roller-Smith Co. Includes potential transformer with several primary coils for different voltage ranges and a secondary connected to moving mechanism of instrument.

1,126,295. Primary Battery. A. L. Saltzman, assignor to New Jersey Patent Co., West Orange, N. J. Four sets of plates are mounted at right angles to each other and supported from the center of the cover.

1,126,311. Motor-Control System. G. E. Stack, assignor to General Electric Co. The counter E. M. F. relay short-circuits the starting resistance as the motor speeds up and short-circuits the dynamic braking resistance as the motor slows down.

1,126,334. High-Frequency Alternator. E. F. W. Alexanderson, assignor to General Electric Co. Includes a high-speed rotor with many poles, an exciting winding in the stator slots, and a transformer with primary connected to the exciting winding.

1,126,339. Printing-Telegraph System and Alaphabet. C. G. Ashley and J. B. Crippen, Chicago, Ill., assignors to General Engineering & Construction Co. Electric receiver prints a portion of a character with one type face, and then imprints a second type face, thus obliterating the useless portion of one imprint.

1,126,362. Conduit-Outlet Fitting. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Outlet box with one end open and with nipple projecting from other end; a pipe connected to the nipple and a cover for the open end, with an opening through which the pipe passes.

1,126,363. Alternating-Current Motor. D. M. Bliss, assignor to Thomas A. Edison, Inc., West Orange, N. J. The rotor core has a uniformly distributed commutated winding in some of its slots and a short-circuited winding in others.

1,126,369. By-Pass for Incandescent-Electric-Lamp Circuits. E. Booth and N. R. Booth, Halifax, England. Film cutout consists of paper coated on one side with a mixture of finely divided black lead, water and thick gum, and having a number of pin holes punctured therein.

1,126,373. Novelty Advertising Device. L. M. Bowman, Tulsa, Okla., assignor of one-half to G. T. Martin. Electromangeticaly actuated.

1,126,384. Time-Controlled Tripping Coil. G. A. Burnham, assignor to S. B. Condit, Jr., Brookline, Mass. Dashpot regulator for circuit-breaker.

1,126,394. Electric Cord-Plug. T. F. Clark, assignor of one-half to Hobbs Wall Paper Co., Hoboken, N. J. Attachment plug with separate and detachable base and body sections.

1,126,407. Electric Ignition Apparatus for Internal-Combustion Engines. G. Cowcher, Wimbledon, England. Details of spark plug.

1,126,412. Electric Control System for Railways. R. C. Dawson, assignor of one-fourth each to L. N. Morgan, T. F. Wiley and G. Turner, McKeesport, Pa. Includes a flying switch adapted when thrown by a train passing in one direction to establish a line connection and to break it when a train passes in other direction.

1,126,422. Storage Battery. R. Drambourg and J. E. Reid, New York, N. Y. Hollow electrode casings contain plates of opposite polarity.

1,126,434. Controller for Electric Circuits. A. F. Feller, Berkeley, Cal. Liquid contact-maker for reciprocating device.

1,126,454. Berth Lamp. W. S. Hamm, assignor to Adams & Westlake Co., Chicago, Ill. Face plate carries recessed socket and lamp housings and protruding lamp-protecting cover.

1,126,455. Electric Snap Switch. H. H. Hansen, Chicago, Ill. Special mounting for indicating dial on spindle of rotating switch.

1,126,459. Block-Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Depends on the connection of different phases of the polyphase current source.

1,126,483. Relay and Method of Operating Same. C. Kinsley, Chicago, Ill. For printing telegraph receiver.

1,126,486. Fixture Support. J. G. Knight, New York, N. Y., assignor to J. Gordon Knight Electric Co. Ball-and-socket, adjustable, insulating joint. (See cut.)

1,126,494. Electric Switch. M. Levison, assignor to Chicago Signal Co., Chicago, Ill. Has special latch-held knife blade.

1,126,546. Brush-Holder. E. Mattman, assignor to Allis-Chalmers Mfg. Co. Includes a compression spring and a tension spring.

1,126,576. Railway Block System. T. H. Schreiber, Baltimore, Md. Electrically operated train-signaling and stopping system.

1,126,594. Rotor for Motors. W. G. Viall, Bridgeport, Conn. Squirrel-cage rotor formed with flexible open-ended copper cylinder with slots fitting over the core teeth.

1,126,602. Gearing. E. R. Whitney, assignor to Commercial Truck Company of America, Philadelphia, Pa. Armature shaft pinion and gears are inclosed in extension of motor casing.

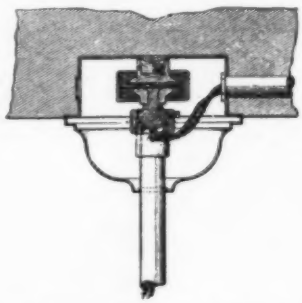
1,126,608. Toy Railway. P. H. Woodruff, Chicago, Ill. Has battery and electromagnet on car, which is propelled by periodic attraction of iron track plates.

1,126,615. Polishing-Machine for Floors. E. Cavicchi, Quincy, Mass. Motor-driven.

1,126,620. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. Lamp-circuit resistance regulator for axle-driven car-lighting set.

1,126,623. Alteranting-Current Block-Signal System. C. D. Ehret, Ardmore, Pa. Alternating current of different phases is impressed on neighboring blocks.

1,126,627. Process for Electrolyzing Alkali-Chloride Solution. W. Gaus, Germany, assignor to Badische Anilin & Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. Electrolyte is passed from the anode space through a number of vertical filter diaphragms to the cathode space.



No. 1,126,486.—Adjustable Insulating Joint.

1,126,641. Method of Electric Signaling. C. Kinsley, Chicago, Ill. For printing telegraphic signals transmitted at high speed.

1,126,642. System of Telegraphic Communication. C. Kinsley. High-speed telegraphic printing receiver.

1,126,655. Method of Uniting Sheets of Brass, Aluminium, and Other Metals of High Conductivity for Heat. N. Pröstler, assignor to Gesellschaft für Elektrotechnische Industrie M. B. H. Berlin, Germany. Electric spot welding of seams.

1,126,665 to 1,126,667. Method of Charging Storage Batteries. D. H. Wilson, assignor to Wilson Storage Battery Co., New York, N. Y. Lead batteries with special low-resistance leading-in conductors are charged at heavy rates, either tapering, periodic, or periodic with intermediate brief reversals, according to the three respective patents.

1,126,668 to 1,126,670. Apparatus for Charing Storage Batteries. D. H. Wilson, assignor to Wilson Storage Battery Co. Time-controlled means are provided for making the charge taper, periodic or periodic with intermediate reversals, according to the three patents.

1,126,671. Storage Battery. D. H. Wilson, assignor to Wilson Storage Battery Co. Has lead-sheathed, copper or other low-resistance busbar and similar imbedded distributing bars leading from the bus to the interior of each plate.

1,126,672. Electric-Lamp Fixture. G. J. Dormandy, assignor of one-half to United Shirt & Collar Co., Troy, N. Y. Adjustably secured to an upright on the table are lamp-carrying arms normally horizontal.

1,126,676. Ignition Dynamo. C. T. Mason, Sumter, S. C., assignor to Sumter Electrical Co. Special stator construction.

Patents Expired.

The following United States electrical patents expired on January 25, 1915:

597,782. Telephonic Installation. G. Ritter, Stuttgart, Germany.

597,785. Apparatus for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

597,786. Telephone Circuit. C. E. Scribner.

597,787. Apparatus for Telephone Switchboards. C. E. Scribner.

597,790. Electric Cable. W. S. Smith and W. P. Granville, London, England.

597,799. Electric Railway. E. C. Crocker, Bridgeport, Conn.

597,816. Armature-Winding Machine. C. Eickemeyer, Yonkers, N. Y.

597,846. Manufacture of Storage-battery Grids. W. W. Griscom, Haverford, Pa.

597,848. Trolley. G. A. Hall, Portland, Me.

597,855. System of Electrical Distribution. H. Linton, Altoona, Pa.

597,880. Electric Furnace. W. S. Horry, Sault Ste. Marie, Mich.

597,891. Electrically Actuated Lock for Bicycle Racks. F. V. Walstrom and J. Erickson, Chicago, Ill.

597,945. Electric Furnace. C. S. Bradley, Avon, N. Y.

597,964. Light-refracting and Magnifying Envelope for Incandescent Lamps. F. W. Dunlap and J. R. Quain, London, England.

597,965. Coin-controlled Machine. H. T. Emeis, Salt Lake City, Utah.

597,979. Electric Switch. J. L. Hinds, Syracuse, N. Y.

597,985. Electric Meter. G. Kapp, Berlin, Germany.

598,001. Electric Switch. J. R. Newell, Titusville, Pa.

598,033. Electric Signaling Device. E. A. Stout, Jr., Philadelphia, Pa.

598,049. Electric Burglar-alarm System. C. Coleman, Chicago, Ill.

598,062. Device for Preventing Accidents on Railroads. H. Biermann, Breslau, Germany.

598,063. Electric Burglar-alarm System. C. Coleman, Chicago, Ill.

The following electrical patents expired February 1, 1915:

598,092. Alternating-current Motor. A. Heyland, Frankfort-on-the-Main, Germany.

598,106. Fusible Cutout. E. A. Lowe, North Plainfield, N. J.

598,109. Insulating Attachment for Electrical Connectors. R. P. Osgood and J. D. Osgood, Methuen, Mass.

598,160. Electric Fire Alarm, Circuit and Signal Box. L. G. Rowland, Camden, N. J.

598,172. Telephone System. C. A. Barron, R. T. Reid and J. L. McDonnell, Tacoma, Wash.

598,180. Apparatus for Electrolytically Producing Zinc. C. Hoepfner, Giessen, Germany.

598,183. Telephone System. R. T. Reid and J. L. McDonnell, Tacoma, Wash.

598,184. Conductor for Electric Railways. G. Ritter, Stuttgart, Germany.

598,193. Apparatus for Electrodeposition of Gold and Silver. E. Andreoli, London, England.

598,198. Electric Lamp for Bicycles. P. A. Dowd, Boston, Mass.

598,199. Mechanism for Starting, Stopping and Controlling Speed of Motors of Electric Cars. F. H. Foster, Brooklyn, N. Y.

598,208 and 598,209. Electric Meter. C. D. Raab, Kaiserslautern, Germany.

598,218. Adjustable Support for Incandescent Lamps. W. J. Going, Amsterdam, N. Y.

598,219 to 598,221. Support for Incandescent Lamps, Etc. W. J. Going.

598,260. Electrical Conductor. L. C. Werner, Broadbrook, Conn.

598,269. Polarized Signal Bell. F. R. McBerty, Downers Grove, Ill.

598,271. Brush-holder. A. J. Oehring, Chicago, Ill.

598,272 and 598,273. Instrument-winding Device. A. J. Oehring.

598,276. Self-restoring Annunciator. J. Steiner, Brooklyn, N. Y.

598,285. Telephone Apparatus. F. B. Cook, Chicago, Ill.

598,313. Electrodeposition of Lead. E. P. Clark, New York, N. Y.

598,316. Electric Gas-lighting Apparatus. C. Eickmann, Indianapolis, Ind.

598,318. Electric Furnace. J. E. Hewes, Philadelphia, Pa.

598,328. Terminal Head for Electrical Conductors. C. H. Sewall, Chicago, Ill., and H. E. Procunier, Oak Park, Ill.

598,358. Electric Circuit-controller. W. T. Budds, Charleston, S. C.

598,408. Machine for Making Type Bars. B. F. Bellows, Cleveland, O.

598,410. Fire and Burglar-alarm System. C. P. Bostian, Milton, Pa.

Electric Vehicle Section

Constant-Potential Charging System in Chicago Garage.

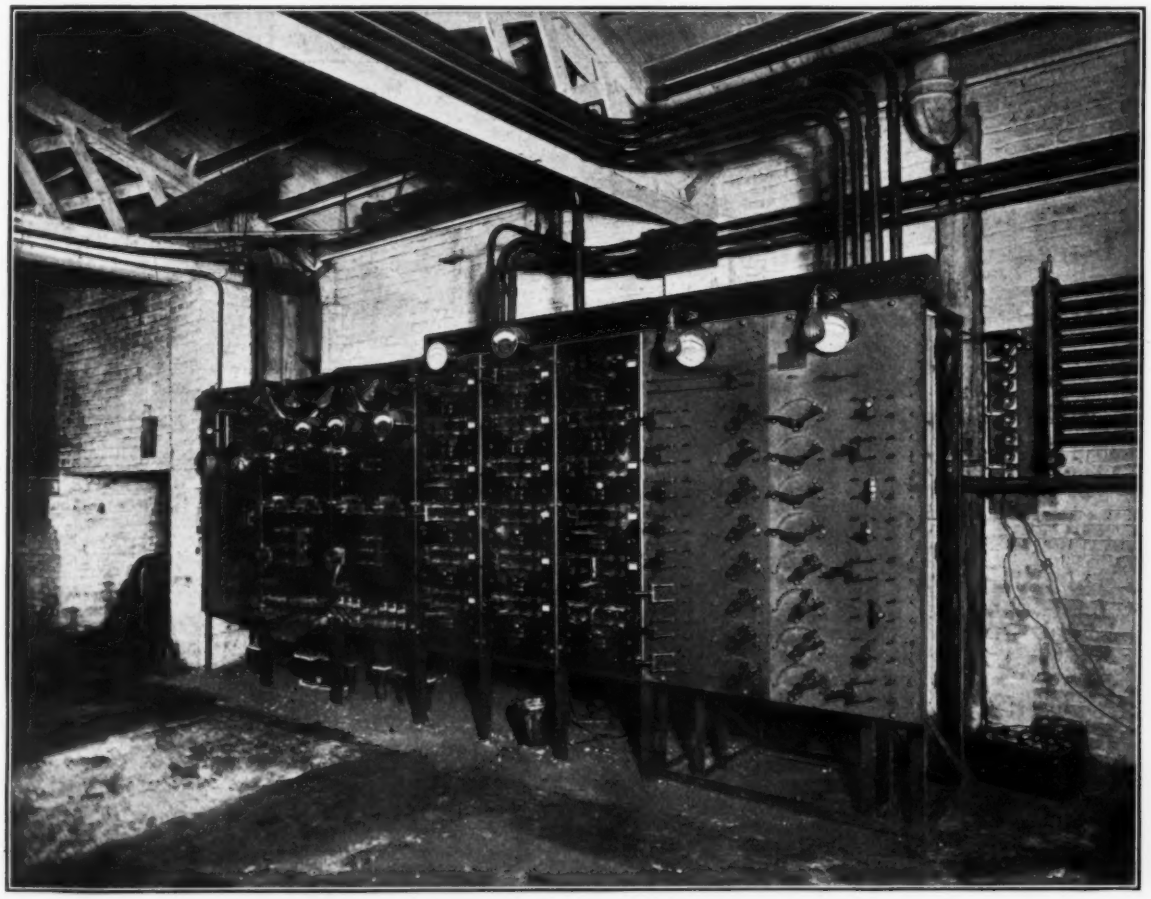
The constant-potential system of battery charging is attracting considerable attention because of the economical current consumption, and because of the short time consumed in charging. Interesting data are given in this article on two Chicago garages using this system in connection with rotary converters.

Quite recently several of the progressive electric-vehicle garages in Chicago have adopted the constant-potential system of battery charging and the results so far seem to have fully justified the change. The Hollywood Garage, at 5656 Broadway, Chicago, was sufficiently impressed with the new system to discard its gas-engine driven equipment for two rotary converters and now purchases all power from the Commonwealth Edison Company. The White Garage, located at 918 Sheridan Road, also recently decided in favor of the constant-potential system of battery charging, in this case substituting two rotary converters for a motor-generator set and mercury-arc rectifiers.

There is much to say in favor of the constant-potential system, as is indicated by the results being achieved in Chicago, St. Louis and elsewhere. Batteries in any state of discharge can be put on charge with the voltage properly adjusted, and will automatically receive their charge without further attention. A fully discharged battery will take a very high current, at first, but this will taper off as the charging progresses and will finish considerably below the usual "finishing" rate. The charge will be completed in a shorter time than under the old method. The cells will not reach the gassing point, and will therefore not be injured by being left on charge longer than necessary.

In connection with the latter, the battery manufacturers all agree that if gassing is not permitted the ampere-hour efficiency rises close to 100 per cent. Hard gassing wastes current and money and since it washes the active material off the plates, it is a very good means of shortening the life of the battery.

The advantages of the constant-poten-



Main Charging Board at the Hollywood Garage, Chicago.

tial system as regards battery life will become more and more apparent as the batteries charged under it become older and show greater average life. As to the other advantages, these are clearly evidenced in the case of the Hollywood Garage. As in most other garages in the larger cities, customers frequently drive their cars until midnight so that it would many times be impossible to have the car in the garage before 1 o'clock a. m. Generally it is necessary to have these same cars in front of the owner's residence by 7:30 a. m., so that under the old conditions it was practically impossible to give a battery proper attention in this short time, especially as the vehicles had to be washed after they reached the garage. Since the installation of the constant-potential system it is found that a battery 75 per cent discharged, if in good condition, would at the end of two hours be 85 per cent charged and at the end of three hours over 90 per cent charged. This rapid charging is, moreover, done without harmful gassing.

The Hollywood Garage is devoted principally to the care of passenger cars although at the present time two vehicles of the American Express Company are garaged. Exclusive of these there are 28 running cars cared for and the average number charged per night is 21. These cars are equipped principally with 40 and 42-cell batteries, there being only three of smaller size —one 28-cell car, one 30-cell and one 34-cell.

All cars are garaged on a flat-rate basis, which covers charging, washing and polishing, adjustments, care of battery, and delivery of car to and from garage. The rate for the 40 and 42-cell cars is $40 per month, while the smaller cars are given the same service for $35 per month.

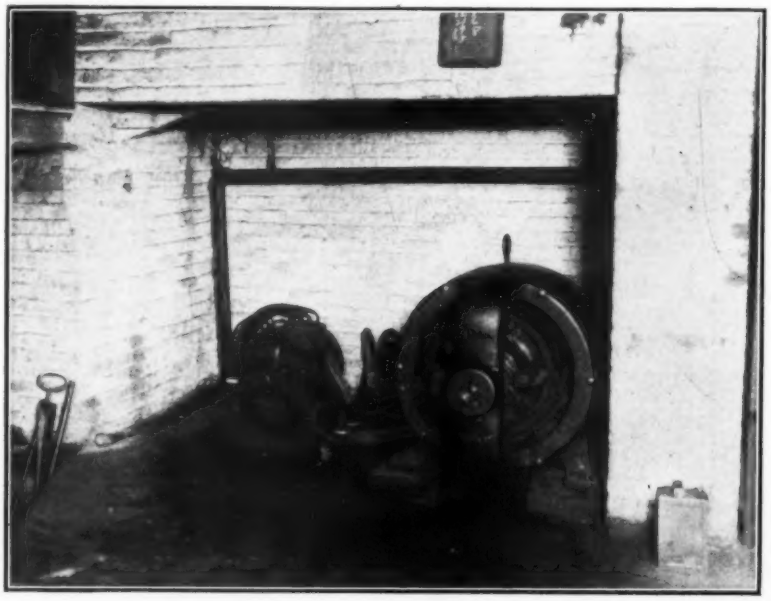
The Hollywood Garage purchases its power from the Commonwealth Edison Company under a limited-hour contract, which provides for a penalty if energy is used during certain specified peak hours. No charging is therefore started until about 9 p. m., although a number of cars come in before that hour. The average duration of the charging period is 3.5 hours so that considerable time is available to give every battery a sufficient amount of attention.

The charging equipment at this garage comprises two Martin rotary converters, of 50 and 10 kilowatts capacity respectively, manufactured by the Northwestern Electric Company, Chicago. These machines embody all of the advantages of the ordinary rotary converter, of which the chief advantage is high efficiency, and in addition are as easy to start as the ordinary motor. A view of these two machines is shown in one of the accompanying illustrations. The two converters are set for separate voltages so that batteries of different sizes can be charged without delay.

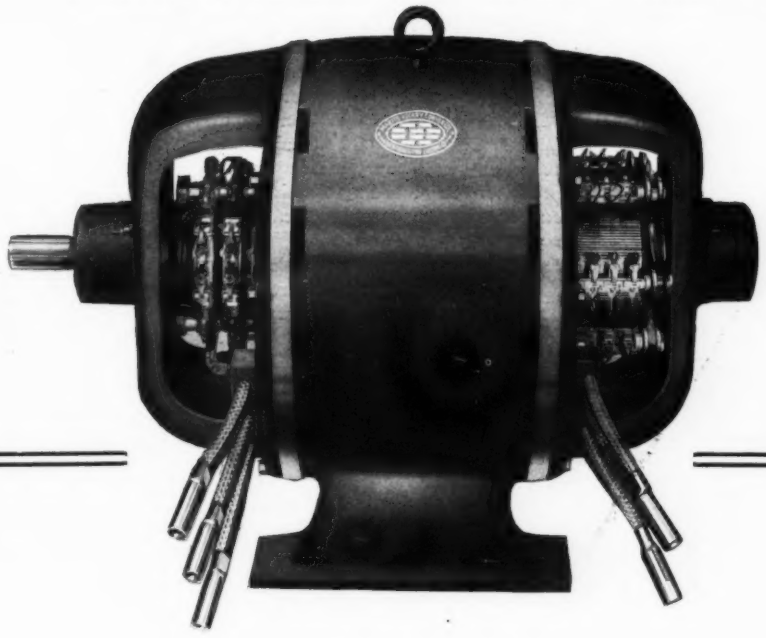
General View of Hollywood Garage with Vehicles in Place.

Previous to the installation of these rotary converters a gas-engine equipment was in use, comprising a gas-engine driven direct-current generator. No record of the kilowatt-hour output of the machine is available, but during the month of December, 1913, selected as a typical month, careful tests indicated a gas consumption of 240,600 feet, which at 80 cents per 1,000 cubic feet amounted to $192.48 for fuel. It was also found that the consumption of gas per kilowatt-hour generated was 27 cubic feet. For the month under consideration, therefore, it was found that the electrical output was 8,911 kilowatt-hours.

In addition to this, some energy was purchased from the Commonwealth Edison Company for lighting and power. This averaged 983 kilowatt-hours per month divided as follows: rectifier, 410 kilowatt-hours; lights, 505 kilowatt-hours; power for small compressor motor, 68 kilowatt-hours.



Two Martin Rotary Converters in Hollywood Garage.



"MARTIN"
ROTARY CONVERTER

IN the White Garage, Chicago, two Martin rotary converters were installed to replace 7 mercury arc rectifiers and a motor generator set, which were used to charge 18 cars per night. The kilowatt-hour consumption per month then averaged 9268. Since the Martin converters have been installed an average of 29 cars are charged per night and the monthly consumption is 9800 K. W. H. An added consumption of 532 K. W. H. per month to charge 11 more cars every night!

is used to most excellent advantage in charging storage batteries, especially on the constant potential system.

"MARTIN" ROTARY CONVERTERS are designed to operate on 100-220-440 volt, 25-30-60 cycle A. C. lines, and in sizes from 1/6 to 50 K. W., delivering any desired D. C. voltage to suit the battery. The best possible economy is secured as batteries can be charged without resistance on the constant potential system. THE "MARTIN" CONVERTER is superior to motor generator sets or any other apparatus for this purpose.

For theatres in A. C. districts, the "Martin" Rotary Converter offers to the "Movie" man the ideal means of obtaining pure, white, brilliant light of D. C. quality. The maintenance cost is practically nothing, as there are no fragile globes nor expensive parts to be replaced, a Special Emergency Panel combining in one unit all the resistance, switches and fuses necessary to control any desired number of arcs for projection work.

Write today for further information.

The Northwestern Electric Co.
613-617 West Adams St., Chicago, Ill.

The cost of operation under this system was found, during the month of the test, to be $284.26. This included the Edison bill of $59.08, a gas bill of $192.84 based on a consumption of 240,600 cubic feet, and charges for oil, waste, repairs and engineers' salary.

In determining the proposed monthly kilowatt-hour consumption of the garage, using Commonwealth Edison service, the central-station engineers assumed a conversion loss of 15 per cent over the average output of the direct-current generator. The details of the estimate are shown in the accompanying table:

MONTHLY COSTS WITH GAS-ENGINE PLANT.

Gas—240,600 cubic feet	$192.48
Oil	13.20
Waste	2.00
Repairs	12.50
Engineer—part time	5.00
Light—Commonwealth Edison	31.78
Rectifier—Commonwealth Edison	20.50
Power—Commonwealth Edison	6.80
Total	$284.26

ESTIMATED CONSUMPTION USING EDISON SERVICE.

	Kilowatt-Hours Per Month.
2 Martin rotary converters	10,247.65
Lighting	505.00
Power	68.00
Rectifier	410.00
Total	11,230.65

This consumption, if figured on the Commonwealth Edison Company's off-peak schedule would amount to $284.68 per month. This, it will be seen, is slightly more than the average monthly rate under the old conditions, but as a matter of fact, because of using the constant-potential system of charging, the consumption has not reached the figure estimated and this, together with the many other advantages which have been demonstrated in this installation, make the present costs considerably less than heretofore.

The monthly kilowatt-hour consumption since the installation of the rotary converter has been as follows: May, 8,970; June, 8,320; July, 9,480; August 9,040; September, 9,160; October, 10,600; November, 10,160; December, 10,480.

The switchboard at the Hollywood Garage, shown in one of the accompanying illustrations, comprises two panels of Schaefer Brothers manufacture and six of J. Lang Electric Company's make. The first panel on the left, nearest the rotary converters, is the Edison panel for the control of the incoming lines. The main line switches, a watt-hour meter and a Printometer for recording the time and amount of consumption, are located on this panel.

The second panel is for the control of the 50-kilowatt rotary converter and contains the usual voltmeter and ammeter, a three-pole double-throw starting switch, a three-pole main line switch for the alternating-current side and a three-pole direct-current switch. A Joleen coil for operating a shunt-trip circuit-breaker in case of the failure of the alternating-current supply is also installed.

Both this panel and the adjacent panel for controlling the 10-kilowatt converter are equipped with a revolving selector switch with eight contacts each. These contacts are connected to taps on râtio transformers, on back of the switchboard, which are two-coil open delta connections. Taps are taken on the primary side. There are also three additional taps on the secondary side to take care of line drop. By changing taps on the transformer it is possible to deliver different voltages to the rings of the converter and any desired direct-current voltage can be obtained.

These two control panels are provided with two sets of bus-bars so that it is possible to charge batteries of different voltages by running both machines at the same time.

The remaining panels control the charging circuits, each circuit being equipped with a rheostat which is cut in when the battery is first put on charge. After about 10 minutes this resistance is cut out of the circuit and the charge proceeds without further attention from the attendant. The purpose of the rheostat is to limit the flow of current to 60 amperes at the instant of placing the car on charge, gradually cutting the resistance out until the battery is directly across the line.

All wiring in the Hollywood Garage is in iron conduit, including wiring for the lighting. The charging circuits are carried along the top of the two longitudinal walls and a lead brought down to each plug box, installed about the center of the wall and spaced about 12 feet apart. Each outlet box contains two Electric Apparatus Company's charging plugs.

As previously mentioned the White Garage, Chicago, is another establishment using the constant-potential system of charging with excellent results. In this case, two Martin converters, of 35 and 10 kilowatts capacity, respectively, replaced seven mercury-arc rectifiers and a 12.5-kilowatt motor-generator set. An average of 18 cars were charged per night and the kilowatt-hour consumption for a typical month was 9,268.

When the new equipment was installed, an additional 20-circuit switchboard was provided and the number of cars charged per night increased to 29. The average consumption is now 9,800 kilowatt-hours per month. In other words, eleven additional cars are charged per month with an added consumption of only 532 kilowatt-hours per month.

Department-Store Service Discussed by New York Section, Electric Vehicle Association.

The January meeting of the New York Section of the Electric Vehicle Association was held at the Consolidated Gas Company Building auditorium, 113 East Fifteenth Street, New York, on January 28.

A paper was presented entitled, "Electric-Vehicle Performance in Department-Store Service," by Edward Callan, of the Callan Department Store, Third Avenue and One Hundred and Twenty-First Street, New York City.

The principal points of this very interesting address were that the Callan

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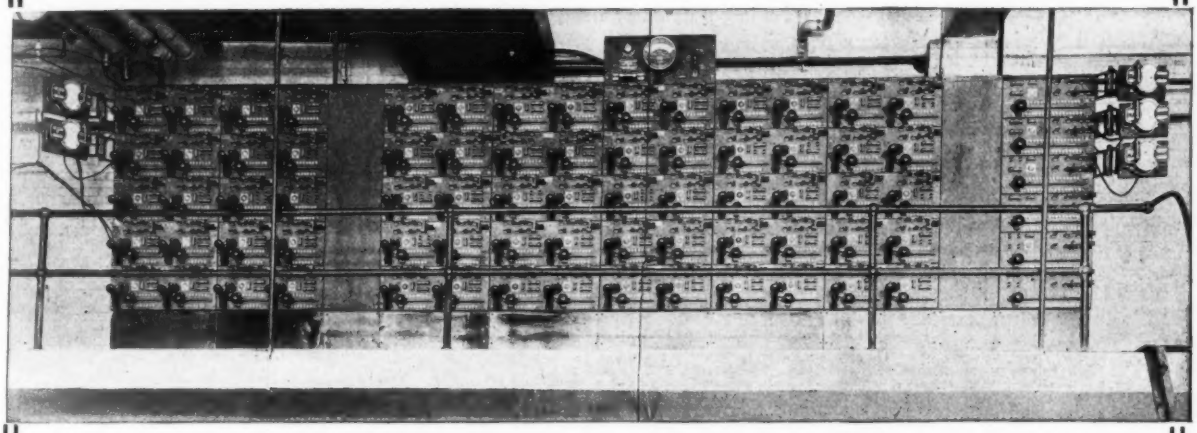
THE ELECTRIC STORAGE BATTERY CO.
New York Boston Chicago Denver PHILADELPHIA, PA. San Francisco Seattle St. Louis
Cleveland Atlanta Detroit Washington Pittsburg 1888-1915 Rochester Los Angeles Portland, Ore. Toronto

Ward Bread Company again chooses Cutler-Hammer Battery Charging Equipment



New Ward Bread Co. battery charging equipment for charging 70 vehicles with a six-rheostat panel for discharging and forming. Cutler-Hammer unit type (sectional bookcase style) rheostats employed. Simple, durable, low first cost, unlimited expansion, easy to operate.

After a long experience with Cutler-Hammer Rheostats in Brooklyn and New York plants, Ward Bread Company now installs Cutler-Hammer equipment in the new Boston bakery

Isn't this the strongest recommendation possible? The Ward Company is known for its efficient delivery systems, its hundreds of electrics carry bread to all parts of Manhattan Isle on regular schedule time. Back in the New York and Brooklyn plants the sturdy and efficient Cutler-Hammer charging equipment keeps these electrics in prime running condition.

A new plant is now built, mistakes or errors discovered in running the old ones are eliminated—what has proved unsatisfactory is not installed again. But we find the equipment that is back of the electric delivery system is again Cutler-Hammer. As our friend from Battle Creek would say—"there's a reason."

Address our nearest office for authentic Battery Charging Equipment information

THE CUTLER-HAMMER MFG. CO., MILWAUKEE

NEW YORK: 50 Church St. CHICAGO: Peoples Gas Bldg. Pittsburgh: Farmers' Bank Bldg. BOSTON: Columbian Life Bldg.
PHILADELPHIA: 1201 Chestnut Street CLEVELAND: Schofield Building CINCINNATI: Gwynne Building
PACIFIC COAST AGENTS: H. B. Squires Co., 579 Howard St., SAN FRANCISCO; San Fernando Bldg., LOS ANGELES and Morgan Building, PORTLAND, ORE.

Department Store used to employ seven horses and five wagons and one stable man, which were replaced in September, 1913, by two electric trucks. One has a capacity of one ton, the other of a half ton. They are of the regular delivery style, the body of the former, 120 inches long, 57 inches wide; the other, 90 inches long and 46 inches wide.

Soon after December, 1913, another one-ton electric truck was acquired, the duty of the latter being to take part of the route of their two-ton gasoline automobile and to keep that in reserve in case of breakdown of the other machines and also to improve upon the delivery system in general.

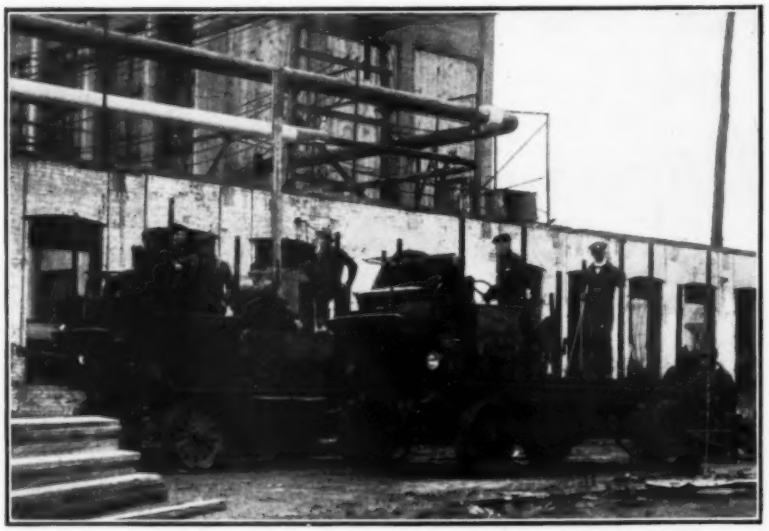
The author states that while this concern had already tried out the half-ton electric trucks and had obtained 48 miles without recharging, they made the experiments with a one-ton electric car, in order to establish the relative operating cost of the electric and gasoline car, and it was soon evident that the difference in operating charges was from $2 to $3 per day in favor of the electric truck (on the same route). By means of electric automobile service, this department store was placed in a position to deliver all goods within 24 hours, a condition which could not be established with a horse and wagon delivery, and in addition, the electric vehicles cover a wider delivery field than previously was possible with horse and wagon. It should also be noted here that the chauffeur of the gasoline car as a skilled mechanic received $1 a day more than the drivers of the electric vehicle. Further, this concern had had hardly any repairs whatsoever on the machinery of the electric automobile, while the repairs of the gasoline automobile in spite of the fact of having a skilled mechanic's attention, often delayed the delivery of the goods to such an extent that customers became dissatisfied.

Mr. Callan pointed out that, owing to simplicity the electric car has all the advantages over the gasoline car and that the delivery of goods is greatly facilitated with an electric car. Further, he expresses his opinion that according to their experience, an electric vehicle could run a distance of 40 miles and during some parts of the year, it might safely run up to 50 miles without being recharged. He further stated that his concern gives a bonus to the drivers of chauffeurs.

Two Powerful, Historic Electric Trucks Aid in Rebuilding the Edison Laboratories.

In facilitating the rapid reconstruction of the laboratories of Thomas A. Edison, at West Orange, N. J., which were recently destroyed by fire, there are two very important factors in the form of a couple of five-ton electric trucks. These trucks are doing heavy hauling in connection with the rebuilding, and are transporting hundreds of tons of machinery a day.

The excellent work which they are doing recalls the interesting history of these same trucks extending over a period of twelve years, and brings to mind a remarkable feat accomplished by them ten years ago. They are Nos. 704 and 705 of the electric-vehicle fleet of the New York Edison Company, and are merely loaned to Mr. Edison on account of their huge capacity. It was in 1904 that these trucks hauled the biggest block of stone ever brought into New York City, with the exception of Cleopatra's needle, from Pier 4 at the foot of Broad Street, to the site of the Custom House. The great stone was quarried and dressed on Hurricane Island, in Penobscot Bay, Me. It took three years to do the work and the cut stone was valued at $10,000. At the bulkhead between Piers 3 and 4, East River, it was placed on a special truck and hauled to the site of the Custom House.



Two New York Edison Trucks Aiding in Rebuilding of Edison Laboratories.

Since then these trucks have been continually in the service of the transportation department of the New York Edison Company, and during the past year, owing to the use of roller bearings which supplanted the bronze type, it was possible to cut four cells from each battery, thereby reducing the number of cells per battery from 48 to 44. Each of these trucks is equipped with an electric windlass for hoisting and cable-pulling purposes. All manufacturers of electric vehicles may point with pride to these two remarkable examples of electric-truck endurance and service.

Central-Station and Electric-Vehicle Interests to Hold Joint Meeting in Boston.

A meeting of the managers and chairmen of committees for the convention of central-station men and electric-vehicle interests, to be held in Boston, March 9 and 10, occurred on January 29 at the Engineers' Club, Boston.

President L. H. Gibbs, of the New England Section, National Electric Light Association, and of the Boston Motor Car Club, was chairman, and outlined plans for the convention. Present arrangements contemplate two sessions on March 9, at which questions will be discussed after a five-minute opening presentation of the subject by a designated delegate.

March 10 will be devoted to electric-vehicle problems, at morning and afternoon sessions. A visit to the Boston Auto Show in the evening is proposed.

The following are the managers and the chairmen of the convention committees:

Managers, for first day: Wells E. Holmes, Cambridge, Mass.; second day, E. S. Mansfield, Boston.

Chairmen Question Box Committee, first day, Eugene Carpenter, Martha's Vineyard; second day, Day Baker, Boston.

Chairmen Information Committee, first day, La Rue Vredenburgh, Boston; second day, David W. Beaman, New Bedford, Mass.

Chairmen, first evening, R. W. Rollins, Worcester, Mass.; second evening, C. H. Miles, Boston.

Chairmen Club Relations, J. S. Codman, Boston; Publicity, W. B. Conant, Concord, Mass.

The ushers will be: first day, C. E. Greenwood; second day, Mervyn Falk.